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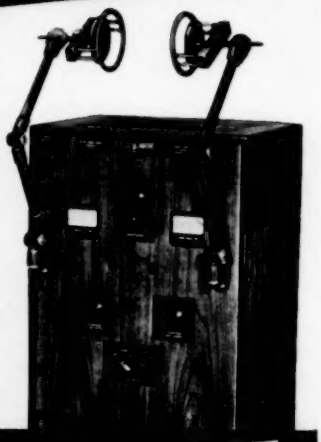

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EVALUATION OF FEVER THERAPY AFTER SIX YEARS' EXPERIENCE *

WILLIAM H. SCHMIDT, M.D.

PHILADELPHIA

During the past seven years the technic of fever therapy has been gradually and steadily improved. A vast amount of investigation on the effects of fever on the blood, body fluids, circulation, respiration, chemistry and metabolism has been carried out, resulting in the establishment of many interesting facts.

The blood changes are mainly those of concentration. The hemoglobin and red cells show a distinct increase. The white cells show a far greater proportionate increase, and there is a distinct stimulation of the formation of new polymorphonuclear cells. This is a selective effect and not a concentration phenomenon. Doan and Hargreaves[1] studied the blood changes during fever therapy, and showed that the white cells were discharged into the blood in waves, and were of the progressively younger type. The blood chemistry has been studied by a number of workers, including Perkins[2] Neymann and Osborne[3], Bierman and Fishberg[4] and others. They have shown an increase in the nonprotein nitrogen uric acid, blood chloride, serum calcium, lactic acid, blood sugar and creatinin, and a decrease in the carbon dioxide capacity of the plasma. All these are transient phenomena, and promptly return to normal when treatment is stopped.

As the temperature rises there is a corresponding increase in the respiration and pulse rate. The systolic pressure shows a slight rise, but the diastolic soon falls, and at times goes to zero, thus producing a markedly increased pulse pressure. This pressure is probably due to dilatation of the peripheral capillaries. As might be expected, there is a pronounced, temporary increase of the basal metabolic rate.

Selection of Patients

Great care should be exercised in selecting cases for fever therapy. It must be realized that it requires a robust constitution and normal bodily functions to safely undergo fever therapy. The treatment is strenuous, and unless due care is taken in the selection of patients considerable difficulty will be experienced. Fatalities are not unlikely to occur even under these circumstances, but the greater the care the better the chance of avoiding difficulty. A good policy is not to select cases that would not be considered a good surgical risk. There is always considerable strain on the heart, and a normal cardiovascular system is essential. Valvular disease which is compensating is not a contraindication. Care must be taken in cerebrospinal disease where there is a possibility of involvement of the thermo-regulating centers, as sudden and uncontrolled rise of temperature is one of the dangers to guard against. Tuberculosis or moderately advanced degenerative disease of the heart, kidneys, or nervous system must be carefully eliminated. On general principles persons over fifty years of age should not be treated, or only selected after careful consideration. In the selection of cases much depends upon the type of treatment to be employed. If we are using only a temperature of 102 F. we can be more liberal in our selection, while with a temperature of 105 F. greater care must be taken.

* Read at the Mid-Western and Southern Sectional Meeting of the American Congress of Physical Therapy, St. Louis, Missouri, March 9, 1937.

Apparatus to produce the initial rise of temperature are of different types. We first used diathermy, which was satisfactory once the technic was perfected, until the development of the cabinet made this appliance preferable. We have used a cabinet producing infra-red rays and found it very satisfactory. Later we employed a cabinet equipped with vaporized hot water at a temperature of 130 F. We found this sanitary, comfortable and rapidly effective, producing a temperature of 105 F. in about one hour. This had the additional advantage that a cold spray could be used at any time to cool the skin and relieve the tension when the temperature reached the higher levels. So far we have found this the best method of producing fever. The tendency on the part of some workers has been to swing back to the high frequency currents on the ground that there is a difference between internal heating as exemplified by the high frequency current, and external heating as produced by the various cabinets utilizing infra-red rays. The arguments in favor of internal heating are merely a matter of clinical experience, which would vary with the individual.

Evaluation of Effects

The problem of a rapid pulse with external heating can be obviated with the apparatus we use at present. However, the pulse rate is so dependent upon the individual's cardiac mechanism, and frequently on the emotional state, that more clinical and scientific data will have to be produced to support any dogmatic statements. The ideal technic for fever therapy has probably not yet been perfected, and certainly an experienced personnel is probably the most essential factor in the success of this therapy.

The range of therapeutic temperature is of utmost importance. The inexperienced may have an idea that it is an easy matter to reach and maintain any given degree of fever. This is certainly not true with temperatures above 105 F. There is a personal factor present in every case. Some patients develop fever easily, while in others it is difficult to raise the temperature. Patients with a calm nervous disposition stand the treatment well, but the emotionally unstable are very difficult to handle. We have found that in such cases it takes more than one hour to reach the desired level, the patients becoming restless and difficult to restrain. As soon as further application of heat is stopped the management is much easier and the elevation can usually be maintained by wrapping the patient in blankets. He is then removed to his bed, and if the temperature tends to fall, a number of hot water bottles are placed under the blankets. This method has proved satisfactory, and enables one to treat a number of patients in one day with one cabinet.

It is quite probable that as our experience increases we will be able to set a certain temperature for a definite duration as the proper treatment of a designated condition. There are some diseases in which it will be necessary to maintain high temperatures, between 106 and 107 F. for six to eight hours. At the present time it is being done with the idea that a lethal temperature for certain bacteria can be obtained in the human body without producing damage to the body itself. It is questionable whether this is always necessary.

It has been amply demonstrated that the spirochaete pallida and the gonococcus can be destroyed by a hyperpyrexia which is easily borne by the body, and at the present time our efforts have been to maintain such bactericidal temperatures. It must be realized, however, that the body reacts in other ways than by elevation of its heat. There is a marked increase in its chemistry, metabolism, a definite leucocytic stimulation and probably an increase in antibody formation. These factors themselves, in addition to

the fever, are capable of ridding the body of bacterial invaders. It has also been demonstrated that a temperature around 107 F. is not without deleterious effects upon the body. This is particularly true if certain degenerative changes have taken place as a result of disease. In autopsies performed on patients who have succumbed to such high temperatures, there have been demonstrated petechial hemorrhages in the spleen, liver, brain, and other organs of the body. If it is possible to accomplish results with temperatures around 105 F. the utility of this therapy will be much greater and safer in the hands of the average physician. Personally, I believe it would be better if the same results can be accomplished, to use a temperature of 105 for eight hours, rather than a temperature of 107 F. for four hours. In my experience, for various reasons, we have seldom maintained temperatures much above 105 F.

The value of any therapy depends upon the safety with which it may be employed by the average physician. We know that a temperature of 105 in any disease is not considered extremely dangerous, but if it rises to 107, we are distinctly alarmed. The same holds true of artificial fever, and when temperature ranges around 107 are employed, they are distinctly in the danger zone. There are reports in the literature of good results in gonorrhea and syphilis with treatments at 105 F.

There are many other diseases besides the two mentioned which can be and are being treated with temperatures below 105 F. There is also a very large field for prophylactic fever therapy at 101 and 102 F. maintained for one or two hours, in the early stages of many chronic conditions, such as beginning hypertension, chronic nephritis, and various forms of multiple arthritis.

The tremendous stimulation given to the chemistry of the body, the increased metabolism, increased formation of antibodies, and the marked elimination, will certainly aid in checking the vicious circle which eventually leads to these chronic diseases. This is a field in which fever therapy can be safely employed by the average physician and the average hospital with the usual personnel and simple equipment.

Therapeutic Management

The frequency of treatment deserves some consideration. Generally an interval of a day or two between treatments is desirable, as it enables patients to recuperate before the next fever treatment. Occasionally, however, because of economic factors, it is necessary to administer the therapy in as short a period as possible. I have met this situation in much of my work when patients came from a distance and it was necessary to reduce hospital expenses. We have found that in the average patient in good physical condition an elevation of temperature to 105 F. maintained for four hours, can be given at least five times a week and limited to a total of ten treatments in two weeks. There is usually considerable weakness following such a series of treatments, but if the patients are in fairly good condition they recuperate within two weeks. If the patient is in a weakened condition to start with, the convalescence will be prolonged. The danger is lessened by giving the treatments at longer intervals, when the individual treatments are better tolerated.

As experience increases we find ourselves exercising greater care in the selection of cases to be submitted to fever therapy. We are less inclined to persist in its application in any case where the reaction has been unfavorable. If the pulse rate rises above 160, we believe that the treatment should be terminated, and no further attempt be made to elevate the temperature during the session. It is not always necessary to reduce the tem-

perature, because as a rule when further application of heat is stopped, there is a tendency for the pulse rate to return to a more normal rate. If the pulse persists in remaining above 160, the patient's temperature should be allowed to return to normal. We do not hesitate to terminate the treatment if any other unfavorable symptoms arise. It should be emphasized that the patient should be under careful nursing control until the temperature has returned to normal.

During our six years' experience we have treated 350 cases of various diseases, totaling approximately 4,000 applications. This series has included most of the conditions in which artificial fever is a recognized form of treatment, and some conditions in which it has not been used before.

Included in this series were 145 cases of multiple sclerosis in every stage of the disease, varying in duration from one month to fifteen years. Multiple sclerosis is a chronic disease, which is characterized by remissions, but is, as a rule, progressive. Sachs[5] in a review of 141 cases observed over a period of years placed the rate of remissions at 42 per cent. It therefore becomes very difficult to report on the results of fever therapy in this condition. These cases will have to be observed over a considerable period to determine whether their remissions are of longer duration than could be expected in the natural course of the disease. In any event, it must be realized that if destruction of nerve tissue has taken place, it cannot be replaced by any form of therapy. Practically every case of multiple sclerosis has such damage, and even in cases that have shown marked improvement there is always some remnant of neurologic injury, such as increased reflexes, ataxia, or spasticity.

However, when it is realized that no form of therapy has been effective in this condition, except in some instances by the quinine treatment, it will be interesting to observe the subsequent course of these patients who have shown at least a temporary favorable response.

It should be said in passing that the greater percentage of cases of multiple sclerosis has not shown any response to treatment with our present technic. Whether a change in technic will produce results in some of these cases remains for the future to determine.

In a general hospital we have not had an opportunity of treating many cases of paresis. Those which we have seen were early ones without marked degeneration. These patients attained a level of 105 F. maintained for four hours, and repeated several times a week for a series of ten treatments. Most of these patients were subsequently given chemotherapy. With this technic we have seen remissions which have persisted for years. The consensus of opinion of workers in this field is that the best results are obtained by a temperature in the region of 106 F. maintained for a period of five to eleven hours. We believe that fever therapy should be followed by chemotherapy, an opinion which is voiced by most workers in the field.

The percentage of remissions obtained by fever therapy varies with the individual worker, the technic employed, and the type of cases treated. Neymann[6] has published a chart of 809 cases of varying type treated by many workers showing a complete remission in 28 per cent and improvement in 35 per cent.

When we consider that the remission rate in general paresis is about 4 per cent, and the use of malaria resulted in 30 per cent remission and improvement, it can be seen that modern artificial fever has about doubled the percentage of remissions and improvements. The death rate following the use of malaria is variously estimated as from 10 to 30 per cent, while in the series of 809 cases the death rate was only 2½ per cent.

The gonococcus has generally been recognized as susceptible to temperature changes, the organism having disappeared during the course of an intercurrent infection accompanied by high fever. Boak and coworkers[7] isolated one hundred and thirty strains of gonoccocci, each with a different thermal death time, varying between six and twenty-seven hours at 106.7 F. This readily explains why all cases do not respond to this form of treatment. The same authors report that 80 per cent of 118 patients became bacteriologically negative after five to seventeen hours of fever at 106.7 F. Other authors have reported similar results.

The results in the female patient with gonorrhea have been further enhanced by the work of Bierman and associates.[8]. They elevate the patient's body temperature above 105, and by means of a special vaginal diathermic electrode raise the pelvic temperature to between 111 and 112 F. for a period of three and one-half hours. By this combination in 98 cases there were 5 failures in that the organism still persisted after one to three treatments; 5 other cases were lost track of, due to inadequate follow-up. In 26 males, 17 were rendered gonococcus-free after one treatment.

I have had no experience with acute gonorrhea but have treated the metastatic forms with excellent results. This is especially true of gonococcal arthritis, which shows a prompt and complete response to this form of therapy. The earlier the case is treated, the better the final functional result. Cases which have resulted in destruction of the joint cannot be expected to return to normal, but if destruction has not taken place, a complete restoration is possible in the vast majority of cases. Neymann collected all published reports, which show 106 cases, 82 per cent acute, and 18 per cent chronic, with recovery in 70 per cent and improvement in 27 per cent, leaving only 3 per cent of failures. We have treated seven cases with a prompt improvement in all except one, in which the gonococcus was probably not the causative organism. Two refused to complete the treatment, but were improved.

One disease in which fever therapy might be of great value, is multiple arthritis. When we analyze the situation, we find a condition which is due to a varied cause, and it cannot be hoped that the same treatment would be successful in every case. We have treated 24 cases of varying types with slight to marked improvement in 15 cases; in 9 cases there was no benefit at all. I have observed that patients with a distinct focus of infection, such as sinus infection, were the ones that responded most markedly, while those of obscure origin showed little if any change. My results were obtained with temperatures between 101 and 102, maintained for four hours. In properly selected cases fever therapy may be applied with the hope that there will be some improvement.

Parkinson's disease does not present a very hopeful outlook for fever therapy, the type occurring in middle age not being benefited at all. The type which follows encephalitis in young persons will occasionally show some improvement, but the symptoms eventually recur. About the best that can be said is that occasionally there is improvement, and the progress of the disease may be checked for a few months, but as a rule permanent improvement is not obtained. Pouppirt[9] has reported improvement in these cases following balneothermotherapy.

Chorea is generally considered an infectious disease, and has been successfully treated by typhoid vaccine. Unfortunately, it is not always possible to get a proper reaction, for which reason artificial fever has been tried. There are many reports of successful use of this method, and a large percentage of these cases can be cured. I have treated 15 cases, many after failure with typhoid vaccine. In 10 cases there was a prompt return to

normal; 2 cases improved; 2 did not improve. There was one death. It is very difficult to control children during treatment which accounts for unsatisfactory results. Many of these have heart involvement requiring especial care and watching.

I have tried fever therapy in four cases of syphilitic optic atrophy, without benefit in any case. This has been the experience of others[10-11] who have treated this condition. On the other hand I have treated one case of optic atrophy of the Leber type, which is characterized by a large central scotoma and almost total blindness. This patient received four courses, each of ten treatments, with the result that his vision was completely restored. No doubt there are many other cases of this type which could be benefited.

Some of the other conditions which I have treated without benefit are mycosis fungoides, blastomycosis, scleroderma, and with improvement, retrobulbar neuritis and asthma. The effect of artificial fever has been tried in many other conditions; sometimes with encouraging results, and at other times without improvement. It is only by such methods of trial and error that we can hope to increase its field of usefulness. There are many conditions which will be amenable to this form of therapy that we do not even suspect today.

The success in fever therapy so far in cerebrospinal syphilis and gonococcal infection justifies its use in every large hospital. In most cases it must be confided to experienced hands in institutions that are willing to recognize its importance and give it the attention it deserves. It must be remembered that this therapy is in its infancy, and while much scientific work has been done, there are many points in technic on which there is no unanimous agreement.

As knowledge increases fever therapy will become specific for a number of diseases. It presents one of the most interesting fields for original investigation.

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FEVER THERAPY IN GONOCOCCIC INFECTIONS *

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AND

RAY G. PIASKOSKI, M.D.

MILWAUKEE

Gonorrhea and its complications is not only widespread but in a majority of instances an affection fraught with considerable disability, and economic loss. The multiplicity of local and systemic methods of treatment that have been advanced from time to time evidence the fact that none has proved effective. Considering the bacteriologically established fact that the gonococcus is destroyed by temperatures within the limits of bodily tolerance, artificial fever therapy suggested itself as a logical procedure.

Recently the thermal death time and heat resisting qualities of various strains of gonococci were investigated by Carpenter and Boak[1], and Warren[2]. Two hundred and fifty strains of Neisseria Gonorrheae were subjected to a temperature of 41.5 C. (106.7 F.). The heat resistance of the gonococcus to this temperature varied from 6 to 34 hours. The mean was 16.1 hours with a standard deviation of 4.8 hours. These investigators also found that when subjected to temperatures of less than 41.5 C., it required a longer time to destroy the gonococcus.

It can readily be seen that there are two important factors in the treatment of gonococcic infections by fever: (1) The height of the temperature, and (2) the length of time such temperature is maintained.

Experimentally, gonorrhea has been repeatedly cured in one treatment by subjecting the patient to as many hours of fever as may be required to destroy a culture made with his particular strain[2]. For example if it were found that a culture required 16 hours at a temperature of 106 F. the patient would be subjected to a single session of 16 to 17 hours at that temperature. But clinically and practically, such procedure cannot be carried out. Most workers have found it convenient to give sessions of 5 to 8 hours between 106 and 107 F. and repeat them till a cure has been established. Others have supplemented fever therapy with local pelvic heat. At the Milwaukee County Hospital, we have had to limit our treatments to 4 or 5 hours at 106 to 107 F.

This introduces a third important factor to the successful treatment of gonorrhea by fever; namely, the number of treatments and interval between treatments.

We have found that if the patient is subjected to a temperature of 106 to 107 F. for 4 or 5 hours, it will require about five treatments to cure the majority of cases of gonorrhea, depending on the heat resisting power of the particular strain. Some cases may require six to seven treatments, and some may not be cured with as many as ten treatments, but fortunately over 90 per cent of the strains can be destroyed by such treatment.

A patient is considered to have received adequate treatment when he has been subjected to a temperature of 106 to 107 F. for four to five hours, with four or five sessions repeated at intervals of one or two days.

These are the mimimal requirements. The more resistant cases will require a greater number of treatments.

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* Read at the Sixteenth Annual Session of the American Congress of Physical Therapy, Cincinnati, Ohio, September 21, 1937.

By complete cure of gonorrhea in these cases we imply:

1. A return of the temperature to normal.
2. Cessation of the discharge.
3. Disappearance of all symptoms such as pain, itching, burning, frequency.
4. Urines which were cloudy, turning clear.
5. Repeatedly negative smears which were previously positive (urethral, urinary sediment and prostatic in males, urethral and cervical in females).
6. Return of the sedimentation rate to normal.
7. Observation of the patient for a period of months to years.

Analysis of Cases

We have treated 95 cases of gonococcic infections from December, 1934 to December, 1936. Sixty of these were male, 35 female.

Of the female patients 12 were complicated by acute salpingitis; 9 by acute arthritis; 3 by chronic arthritis; and 3 by acute arthritis and acute salpingitis. Two of the patients had acute and 4 chronic cervicitis and urethritis; while 2 had chronic pelvic gonococcic inflammation.

According to the standard set above (at least 4 treatments of 4 to 5 hours above 106 F.) 8 patients received treatment which could be considered adequate for a cure, while 27 did not receive treatment which could be considered adequate. Of the 8 patients who received adequate treatment, 7 were cured while one, whom we were unable to follow-up, had four successive negative smears on discharge from the hospital. Of the 27 cases which did not receive adequate treatment, 7 were cured, 9 were not cured, and 11 were not controlled.

Of the 60 male cases 24 were complicated by acute epididymitis; 14 by arthritis; 2 by prostatitis; 1 by seminal vesiculitis; 3 by chronic arthritis; 2 by acute arthritis and acute conjunctivitis; 2 by epididymitis and acute prostatitis; and 1 by tenosynovitis and acute arthritis. Two patients had acute ophthalmitis without urethral infection; 8 had acute antero-posterior urethritis without complication; while 1 had chronic gonorrheal urethritis and prostatitis with a perineal abscess.

According to our standard only 17 of the male patients received treatment which was adequate for cure, while the remaining 43 did not receive adequate treatment. Of the 17 patients who received adequate treatment, 16 had urethral gonorrhea and all except one were cured. Of the 43 patients who did not receive adequate treatment, 42 had urethral gonorrhea. Of these 6 were cured; 9 were not cured; 27 left our control.

Comment

One of the difficulties we encounter most often is in persuading the patient to take enough treatment to completely cure his gonorrhea. Most of the patients with acute arthritis, epididymitis, or prostatitis are so remarkably relieved of all pain and tenderness after one or two treatments that they refuse to undergo a further ordeal because they feel it to be unnecessary. Other patients were given only low temperatures of short duration because of some accompanying condition, such as nephritis, general debility, slight heart disease, inability to stand the strain of treatment, and the like. In some of the early patients we were unable to give satisfactory treatment because of mechanical difficulties with apparatus and inexperience in operating it.

For a period of six months, we subjected the patients with gonorrhea to temperatures of 105-106 F. for four hours. We hoped that such a routine would produce as good results as the higher and longer fevers, and at the

same time would be much less strenuous and provide a wider margin of safety. The results were not satisfactory, and we soon returned to our original standard of adequate treatment. This trial period emphasized the importance of adequate treatment for the successful management of gonococcic infections by artificial fever.

Arthritis

Gonococcic arthritis, while it occurs in a comparatively small percentage of all cases of gonorrhea (about 3 per cent) is certainly a serious complication when we consider its effect on the future function of the joint. The treatment of this condition has, up to the present time, been very unsatisfactory.

Thomas[3], states: "Extensive observations and direct inquiries relative to the treatment of gonococcal arthritis, both by orthopedists and urologists, have revealed the greatest disparity and pessimism in the management of this unwelcome and often obstinate condition. The variability of treatment is striking and unquestionably accounts for many indifferent and poor results. I doubt whether there is any disease in the whole category of medicine where today more inconstant or conflicting opinions exist relative to treatment."

Keefer and Myers write[4]: "In patients who show organisms in the synovial fluid and a cell count above 40,000, the outlook was poor compared with those with a non-infected fluid and a lower cell count. Even in such cases the outlook is not very good as far as complete recovery is concerned, since only 37 per cent of our cases recovered completely without any signs of joint disease."

Wehrbein[5] in a study of 610 cases of gonococcic arthritis says: "The complete recovery of the joint may require only one or two weeks or as much as 6 to 12 months. The outcome may be a normal joint or any degree of permanent change up to bony ankylosis. * * * Therapeutic efforts have been varied, always a sure indication that nothing has been satisfactory." He concludes: "It may be said that we have no specific treatment for gonococcic arthritis at the present time."

In artificial fever therapy, we believe we have virtually a specific for the treatment of gonococcic arthritis. In acute cases of less than 4 or 5 weeks' duration, there is rapid subsidence of pain, tenderness, and swelling. Most of these cases clear up completely, with no residual swelling or limitation of motion. In cases of longer duration or in which damage has been done to the joint structures, the acute symptoms subside rapidly, but the tissue destruction, connective tissue proliferation, or bone changes are not influenced. In chronic cases of extended duration, very little improvement is seen.

In our series were 29 cases of acute gonococcic arthritis. Twenty-five of these were completely relieved usually in one, two or three provocations of fever. Three patients were improved. One had only slight improvement.

There were 6 cases of chronic arthritis varying in duration from two months to many years. Three of these were improved. Three had only slight or no improvement. None were cured.

Typical Case Reports

Case 1. — R. H., aged 20, male, admitted January 18, 1936, complaining of swelling and tenderness of left knee, of 3 weeks' duration. Temperature ranged from normal to 102 F. during this time. Polyuria, dysuria, terminal hematuria of 3 months' duration. Both glasses cloudy. Smears positive. Was given seven fever sessions. There was complete subsidence of pain, tenderness and swelling after the first treatment.

The temperature fell to normal but rose slightly the next day. Both glasses became clear and the smears were negative. He became permanently normal again after the fifth treatment.

Sedimentation Rate

	1 Hr.-2 Hr.		1 Hr.-2 Hr.
January 20	42-79 mm.	February 1	18-34 mm.
January 22	48-78 mm.	February 4	22-54 mm.
January 24	30-62 mm.	February 7	17-36 mm.
January 28	32-68 mm.	February 14	5-12 mm.
January 30	20-44 mm.		

Case 2. — I. K., aged 22, female, admitted August 11, 1935. Temperature 99 to 102 F.; pain left leg with increased heat. Smears negative. Diagnosis acute thrombophlebitis. Treated by rest in bed, traction and immobilization for 4 weeks. Sept. 5, complement fixation test was positive for gonococcic infection. Fever therapy was started on September 13, 6 weeks after the onset of arthritis. Patient was in poor physical condition, weak and emaciated. We were able to give her only low fevers of short duration. There was immediate relief of pain and tenderness after the first treatment and rapid improvement with each successive treatment. The temperature fell to normal following the first treatment. The patient was discharged 3 weeks after beginning fever therapy. There was no pain or tenderness. There was limitation of motion and atrophy of the muscles which was treated by local physical measures. Two months later she was seen by the orthopedic surgeon who pronounced the joint function practically normal.

Sedimentation Rate

	1 Hr.-2 Hr.		1 Hr.-2 Hr.
September 13	50-77 mm.	September 25	25-54 mm.
September 15	59-99 mm.	October 1	9-18 mm.
September 17	61-88 mm.	October 8	9-21 mm.
September 20	40-74 mm.	October 22	9-20 mm.

Complement Fixation Test

September	5	Positive
September	27	Positive
October	18	Negative
January	10	Positive—No Complaints
May	20	Negative

Acute Epididymitis, Prostatitis and Seminal Vesiculitis

There is today sharp disagreement among urologists concerning the best treatment of acute epididymitis. Some men advocate conservative medical treatment, others surgical. Our series embraces 26 cases of acute epididymitis treated by fever therapy. In 23 of these there was immediate and complete relief, usually after one or two sessions. Relief of pain was a striking feature, often after the patient has been under treatment for only one hour or less. Swelling and induration subside less rapidly, but the epididymis and cord structures return to normal in much less time than with any other method of treatment. Another noteworthy observation in many cases was the abrupt fall of the temperature to normal immediately after the first session. The sedimentation rate rapidly returned to normal.

Case Reports

Case 1. — W. B., white man, age 23, admitted December 6, 1935. Temp. 102 F. Pain, tenderness and marked swelling of right epididymis. Both glasses cloudy. Smears positive. No change in condition for 6 days. December 12, 1935, was given a fever treatment of about 2 hours' duration. The next day the temperature was normal. Pain, swelling and tenderness had subsided completely. This patient refused further fever therapy.

Case 2. — M. S., white, male, aged 32, admitted May 30, 1936, complaining of pain, tenderness and swelling of right epididymis. Temperature running between 100 and 103 F. Both glasses cloudy. Urethral discharge positive. Patient was given five fever sessions each about 5 hours above 106 F. The urologist stated that after the second treatment the pain and tenderness had disappeared. Slight induration re-

mained. The temperature fell to normal and remained so until patient was discharged 2 weeks later. Glasses became clear, discharge ceased and smears were negative.

Sedimentation Rate

	1 Hr.-2 Hr.
June 1	54-89 mm.
June 4	35-73 mm.
June 6	30-60 mm.
June 11	13-33 mm.
June 16	10-21 mm.

The following three cases of epididymitis were not relieved.

Case 1. — Man, aged 22 was in weakened condition because of severe pain for past 10 days. Had not eaten and lost 15 pounds in weight. His temperature was about 105 F. for 4 hours. He went into mild shock and it was decided to discontinue fever therapy until he was in better condition. Three days later his temperature rose to 105 F. and there was localized suppuration in the epididymis, which was incised.

Case 2. — Man, aged 43. Treatment had to be discontinued after about 2 hours of treatment because of threatening collapse. The temperature fell to normal after the treatment but the following day rose to 103 F. and there was localized suppuration at the inferior pole of the epididymis. The pus was evacuated by incision.

Case 3. — Man, aged 45. Was given 3 fever session with no improvement. Referred to surgeon. Post-operative diagnosis was acute tuberculosis of the epididymis.

There were 5 cases of acute prostatitis and seminal vesiculitis in this series and all obtained rapid and complete relief of pain, tenderness and swelling, usually after one or two sessions of fever.

Acute Salpingitis

In acute gonococcic salpingitis the pain and tenderness are quickly relieved usually after the first or second treatment. The temperature becomes normal. The sedimentation rate gradually returns to normal.

Our series includes 15 cases of acute salpingitis. Fourteen of these were completely relieved, usually after the first or second session. One patient whom we were able to give only low fevers of short duration, was temporarily improved after each session. Fever therapy was discontinued after four unsatisfactory treatments and she was referred for surgical intervention.

Case 1. — M. F., age 19, entered April 22, 1936. Pain in both lower quadrants with nausea and vomiting. Smears positive. Temperature between 98 to 101 F. No change in condition after one week in bed. Was then given 7 fever sessions at about 106 F. of five hours duration. There was immediate relief of all pain and tenderness. Temperature fell to normal after the last treatment. Smears became negative.

Sedimentation Rate

	1 Hr.-2 Hr.
April 23	65-95 mm.
May 5	49-91 mm.
May 15	29-42 mm.

This patient was followed till Feburary, 1937. There was no recurrence of the salpingitis and all smears remained negative during this time.

Gonococcic Ophthalmitis

Two cases of acute gonococcic ophthalmitis were treated.

Case 1. — T. L., aged 16, entered Milwaukee County Hospital, December 4, 1935, with a diagnosis of right panophthalmitis. Temperature 100.4 F. No urethral infection. Smears from right eye showed gram-negative intracellular and extra cellular diplococci.

December 5, 1935

Blood Count		*Differential Count*	
Hemoglobin	89 per cent	Neutrophils	83 per cent
Red blood cells	4,640,000	Lymphocytes	15 per cent
White blood cells	17,350	Endothelial leucocytes	2 per cent

Sedimentation Rate

	1 Hr.-2 Hr.
December 4	25-42 mm.

Fever therapy was started December 6. This was the fourth day of infection. At this time there was also injection and discharge from the left eye. The ophthalmologist just before beginning treatment noted: There is a profuse thick discharge. The cornea is now greatly involved, showing edema, discoloration and opacity. Smears from both eyes show gram-positive diplococci. The day following the first treatment the ophthalmologist found that clinically the eye was definitely improved. There was less edema and the cornea was definitely improved. The left eye showed gram-positive diplococci. A smear of the right eye was not taken. After the second fever session, December 9, the cornea showed more infiltration with threatened sloughing of the external layers. A smear of the left eye revealed no organisms, as proved the case with the right eye. The following day the cornea appeared lost, there being only light perception. The right eye contained many pus cells, but no organisms, while the left eye revealed one pair of gram negative extracellular diplococci. The complement fixation test was negative. The third fever treatment was given December 11. The following day both eyes revealed no organisms. After the fourth session the patient had an anterior staphyloma about ready to perforate with extrusion of the lens and the vitreous. The left eye was clinically improved, the temperature normal.

December 14, 1935

Blood Count		*Differential Count*	
Hemoglobin	85 per cent	Neutrophils	64 per cent
Red blood cells	4,510,000	Lymphocytes	29 per cent
White blood cells	7,150	Endothelial leucocytes	4 per cent
		Eosinophils	3 per cent

Case 2. — B. H., aged 16 months, entered Columbia Hospital, August 11, 1936, with diagnosis of bilateral gonococcic ophthalmitis. Both eyes were swelled shut. There was profuse purulent discharge positive for gonococcic infection. The temperature was 103 F., rectally. This infant was given the first fever session Ausust 12, much of the time between 107-108 F. The following day the swelling completely subsided; there was no discharge, but injection of the conjunctiva was still present. Another fever treatment was given two days later. The patient was discharged cured on August 16.

Conclusions

1. Fever therapy will quickly and permanently cure gonorrhea and its complications in over 90 per cent of patients who are willing and able to undergo adequate treatment.

2. Adequate fever therapy consists of applications at 106 or 107 F., sustained for about five hours, and repeated 4 or 5 times with an interval of one or two days between sessions.

3. The complications of gonorrhea are usually relieved in one or two sessions.

4. Fever therapy, in its present form, is a strenuous ordeal, time consuming, expensive, and of necessity a hospital procedure.

5. It is available to only a small percentage of the total number of gonorrheal patients.

Note: We believe that the first patient was referred for fever therapy too late; the damage had already been done. The other patient was treated early, about 24 hours after the onset. The relief was dramatic and complete.

6. In its present stage of development, it does not replace the routine treatment of simple, uncomplicated gonococcic infection.

7. Fever therapy is indicated in every complicated case of gonorrhea or where there are special conditions demanding a quick and permanent cure.

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FEVER THERAPY SURVEY AT CLEVELAND CLINIC *

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The history of fever therapy has been reviewed by several writers.[1,2] In ancient times hot baths were used empirically in the treatment of various diseases, the Greeks probably being the first to employ this form of therapy. By the seventh century, B.C., there had been established bath houses in which steam and hot air baths were given while the guests reclined at their ease. The ancient Jews, Egyptians, and Chinese advocated hot baths and even aboriginal tribes, such as the American Indians and the negroes of tropical Africa, used hot baths in acute and chronic infections, often with excellent results.

The Chinese and the Japanese, who derived their medical practices from China, were among the earliest peoples to use their intensely hot springs to treat syphilis, arthritis, acute infections of the genito-urinary tract and respiratory, nervous, digestive and ocular diseases.

In 1714 Fahrenheit's construction of the thermometer stimulated interest in temperature determinations.

The history of the use of malaria for treating paresis and other diseases needs no elaboration, and the same holds true for other substances used to produce febrile reactions. Simultaneously, experimental work was being done with physical agents from which developed the methods in use today.

The Fever Department at the Cleveland Clinic was established early this year. Prior to this time malaria, typhoid vaccine, and foreign proteins had generally been used to produce fever. Patients to be treated by artificial means were referred to the City Hospital where a fever department had already been established.

* Read at the Sixteenth Annual Session of the American Congress of Physical Therapy, Cincinnati, Ohio, September 21, 1937.

To elevate the temperature of the human body, it is necessary not only to introduce additional heat energy but also to prevent excessive loss of heat. Bodily heat is lost through the evaporation of perspiration. It is true that some heat is lost by radiation from the body to its environment, but since their temperature difference is relatively small, this loss is not as great as one might expect. Therefore, to induce fever and to maintain the temperature after it has once been attained, the patient must be placed in an environment in which the temperature is of the same magnitude as that of his own body. It must also be humidified to such an extent that appreciable evaporation from the patient's body does not take place.

Apparatus

These conditions have been achieved in an all-metal cabinet in which provision is made to heat and circulate the air within that cabinet and also to impart to it a high degree of humidity. The all-metal fever cabinet is constructed of aluminum which is light in weight and readily cleaned. The lower compartment is equipped with a fan heater that can be operated at three different temperatures, high, medium, and low. If it should be desired merely to circulate the air but not to impart additional heat, this can readily be done by turning on the fan. The heated air is directed onto a stainless steel pan containing water. The direction at which the stream of air strikes this pan is arranged to provide efficient and uniform circulation of the heated, humidified air over the patient. Mounted on a wooden rack supporting the rubber-impregnated hair mattress on which the patient lies is the applicator for inducing heat in the patient's body. This applicator is a heavily insulated cable in the shape of a loop with terminals brought out at the foot end of the cabinet for ready connection to the short wave apparatus which heats the body by electromagnetic induction. The loop applicator is so placed as to extend approximately from the shoulders of the patient to his feet. The advantage of this application is that the energy input is distributed throughout the patient's body, resulting in a more uniform heating than is possible with other methods.

Before the patient is placed in the cabinet, it is preheated to a temperature of approximately 110 F. Actual measurement has shown that the relative humidity of the air within the cabinet reaches 100 per cent after the patient has been in the cabinet a short time.

It is of the greatest importance to establish a definite diagnosis and to determine if any secondary pathologic conditions exist before accepting a patient for fever therapy. A general physical examination should be made on each patient, including such laboratory work as a complete blood count, urinalysis, and a Wassermann or Kahn test. If no history of a cardiac condition is obtained and if the physical findings are negative, electrocardiography is not indicated in younger individuals. It is, however, advisable to have tracings done routinely on older patients. If a constant high pulse rate is present, it is advisable to determine the basal metabolic rate.

Technic

All patients are instructed to take at least one or two teaspoonfuls of salt the day before treatment. This may be taken in drinking water or with food. Patients are further advised to drink an increased amount of water and to take an enema the evening preceding the treatment. An enema, given on the morning of the treatment, may stimulate or excite the bowel for several movements, which might take place after the patient has been put into the cabinet. This may have a weakening effect on the individual, thus using strength that should be reserved for the treatment.

Breakfast consisting of fruit, toast, egg, and coffee is permitted in the morning. This should be taken about two hours preceding treatment. Before the treatment is started, the blood pressure is taken. The patient is then placed in the cabinet between terry cloths. The latter absorb the perspiration which is very irritating if allowed to trickle down the nude body. A lanolin salve is applied to the lips to prevent the formation of herpes labialis. In some cases, especially where motion of the lower extremities has been lost, it is advisable to protect the heels by bandaging them with cotton and gauze, since the constant pressure on the terry cloth, in addition to the heat, may give rise to abrasions or macerations. During the treatment the temperature, pulse and respiration are recorded every fifteen minutes. All temperatures are taken rectally. A clinical thermometer is employed during the fever induction and its use is discontinued when the temperature is within one to one and one-half degrees of the desired rise. The rectal applicator of an electrical indicating thermometer is then inserted into the rectum which permits a constant reading of the patient's temperature. As one would expect, the pulse rate and respirations are increased, especially during the time the temperature is being elevated. After the short wave apparatus is turned off, a definite drop quite frequently is noted in the pulse rate.

The patient is given all the fluids he desires during the treatment. However, it is advisable not to give large quantities at one time, since this may cause distention of the stomach and vomiting. Plain water and 0.5 per cent salt solutions are given during the treatment. Frequently, the patient complains of hunger pains at noontime and these can readily be relieved by a teaspoonful of dextrose in a glass of water, repeated as often as necessary.

As sedatives we have used pantopon and morphine sulphate. Pantopon was employed in the majority of cases. Its use is determined by the reaction of the patient at the time of treatment. When administered one-sixth grain pantopon is given at the time the "excitement" stage is reached, which is usually at about 102 F. Quite often this amount will suffice. In the higher curves, the dosage is repeated.

It was found that by watching the fluid intake, giving salt prior to the day of treatment, and the judicious use of sedatives, vomiting in fever patients can be markedly reduced.

Tetany was noted in several cases. These reactions were mild and were readily controlled by the administration of one-sixth grain of pantopon and allowing the cabinet to cool temporarily. Thus far it has not been necessary to terminate treatment due to this reaction.

After the treatment is completed, the patient's temperature is permitted to drop. The condition of the patient, the duration of the treatment, and the height of the fever determine whether or not hospitalization is necessary. In some instances the patient rests in the department and is then permitted to go home; others are admitted to the hospital for several hours or until the next morning.

Indications and Results

Since the Fever Department at the Clinic was established, results have been observed which indicate favorable responses and which are comparable to those reported by other writers. However, we do not feel justified in reporting individual results, since an insufficient number of cases of any one disease have been treated.

The following conditions have been treated with artificial fever thus far:

Gonorrhea
- Chronic
- Arthritic

Syphilis
- General paresis
- Tabes
- Taboparesis
- Optic atrophy

Rheumatoid arthritis
Undulant fever.
Multiple sclerosis
Neuroretinitis
Encephalitis

The patients with gonorrhea are treated every fourth day when possible, with a temperature ranging 106 to 107 F. for a period of five to six hours for three to six sessions. In the treatment of the various types of syphilis, Simpson's[3] method of fifty hours of fever given at weekly intervals of five hours over 105 F. is being used. These patients also receive chemotherapy. A temperature ranging 103 F. to 104 F. for three to five hours is employed in rheumatoid arthritis. The number of sessions varies, but usually eight to ten weekly treatments are administered.

In treating undulant fever, the method recommended by the Mayo group[4] is used. This consists of three treatments of five hours each at 104, 105, and 106 F., respectively.

In multiple sclerosis and encephalitis, the height of the fever will vary according to the reaction of the patient. Usually a temperature between 104 and 105 F. is maintained for three to five hours.

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PHYSICAL METHODS OF FEVER PRODUCTION FROM A PHYSIOLOGIC VIEWPOINT *

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Fever therapy by physical means has progressed so rapidly that its physiologic interpretation has been largely neglected. Clinicians have frequently attempted to explain the whole problem solely on the basis of body temperature elevation. Limiting investigations only to the recording of the thermometer is manifestly an unscientific approach.

During the early experiences with fever treatment all sorts of mishaps, ranging from extensive burns to vascular collapse, convulsions, brain destruction and death, have occurred. To the physiologist it is obvious that the responsibility for such complications can be attributed to inadequate consideration of the normal reaction of tissue to insult and of the basic physiology of the thermogenic regulating mechanism. The occasion, then, for this communication is quite obvious.

Discussions of the production of fever by any method, to be of potential value, must take account of the physiologic fundamentals of the normal heat regulating mechanism and its function in the fever process. Despite doubts regarding its exact location, we recognize the existence of a thermogenic regulating centre in the brain base. Transection of the brain superior to this area produces no effect, while transection distally completely abolishes the heat regulating mechanism. Laboratory experiments have confirmed this, time after time. Heat puncture in rabbits as well as lesions in man, occurring in this area, also upsets the mechanism.

Statements like those of Hinsie and Blalock[1] that there are no fibers leading from these centres exerting an influence upon lower metabolic processes must be qualified. The fact remains that transection of the cervical cord at the fifth and sixth segments renders the animal poikilothermous and the temperature fluctuates with the environment. The same effect can be obtained by the use of Curare, a drug which paralyzes the motor nerve terminations. If transection of the cord is performed at a lower level (upper thoracic segments), an increase in heat dissipation results, but part of the heat production or heat maintaining mechanism continues to function. This may be explained by the fact, that in high thoracic segment transection some of the muscles, especially those of the upper extremities, are left intact. Their tonic activity probably plays a role in heat maintenance, observations which have also been made many times by us in the experimental laboratory.

These fundamental principles are paramount in any set-up intended for producing fever artificially. Consideration should be accorded the physiologic principles established by the classic work of Barbour.[2] This investigator exposed the thermogenic centre in the brain base for stimulation by heat or cold. When cold was applied to the center there resulted a peripheral vasoconstriction increased muscular tonicity and metabolism, and occasionally a rigor. The summation of these results is an increase in heat production and a decrease in heat loss. When heat was applied the direct opposite was the result, or a decrease in heat production and increase in heat loss. This work is of importance because it reveals that in infectious or foreign protein fever,

* From the Department of Fever Therapy, Physical Therapy Centre.
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especially in the early stages during the chill, there is a physiologic stimulation of the mechanism which normally protects that organism against *cold* not heat. In the production of fever by physical means the end result is a heating of the blood, which in turn conveys the heat to the thermogenic centre. The peripheral response expected should be similar to that produced when heat was applied to the centre directly.

Physiologic Fundamentals

It is, therefore, obvious from a physiologic point of view that the preferred method is one which will heat the blood stream with the least amount of side chain insult to other tissues or organs. This choice now appears to be more closely represented by electromagnetic induction than by any other current development.

There is a second important physiologic fundamental which has been ignored in the development of fever producing apparatus. The bodies of all warm blooded animals, including man, are equipped with a mechanism for controlling fever when it occurs spontaneously. In man, who is our present concern, the main stem of that control mechanism is his biochemistry and the skin. It is my opinion that the skin and the great subcutaneous lymph space should at all times be left free to eliminate and perspire during fever. Therefore, any apparatus which in order to produce the fever must first superheat the skin and keep it at a temperature higher than the deeper structures is definitely out of accord with normal physiology.

Current Physical Methods for Fever

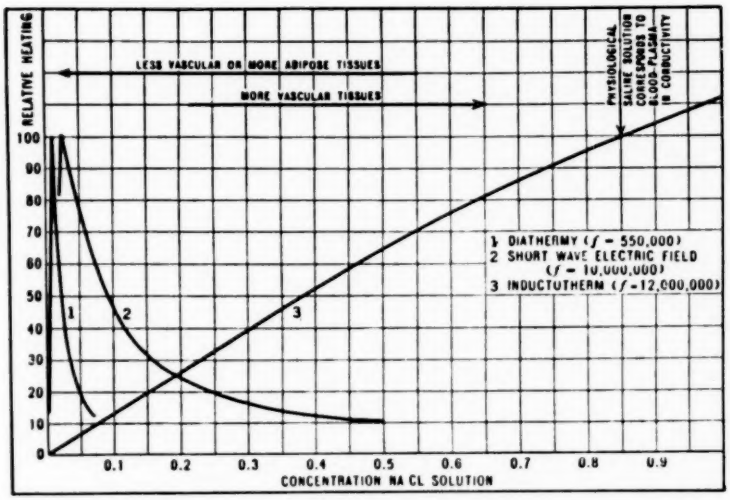
This brings us to the physical methods in vogue for producing artificial fever. One group produces the temperature by radiant or external heat, the other by penetrating heat. In 1928 we began utilizing low grade temperatures in the treatment of metabolic and asthmatic patients. Our methods at that time consisted of baths, incandescent light cabinets and the so-called infra-red dry hot pack. Since more suitable apparatus have been developed, we have supervised and given a total of 7,566 treatments to 753 different patients, representing over 22,500 hours of fever. The apparatus used in this work, in addition to those already mentioned, were electric blankets, hyperpyrexators, diathermy, radiothermy and electromagnetic induction.

In comparing the advantages and disadvantages of the various forms of apparatus, the factors to be considered are: the physiologic principles: the comparative safety; and the economy and practicability of application. Too much stress has been laid on the economy factor. Comparison between the various physical equipment used for generalized fever production is shown by tables and graphs.

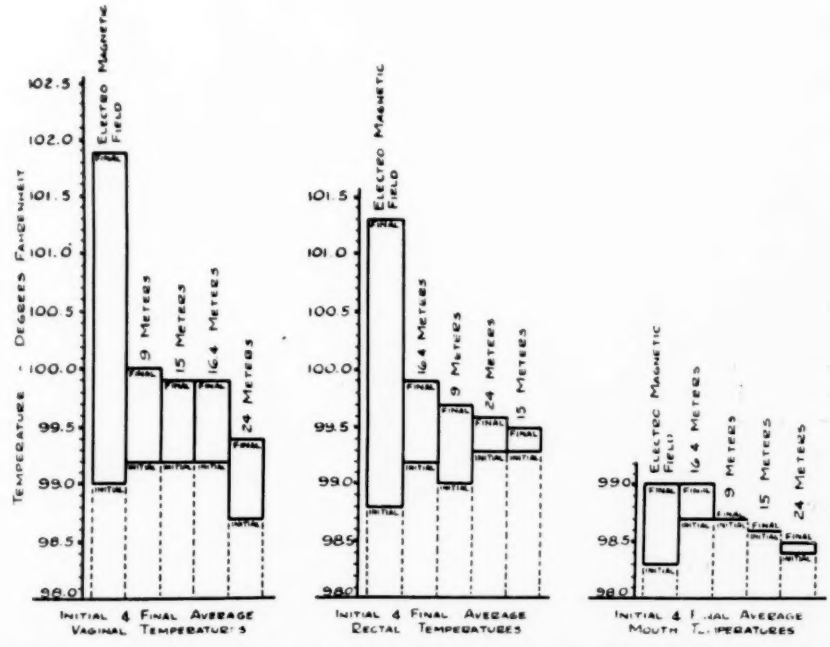
Clinical and Experimental Studies

Graph 1 deals with a comparative study[3] of penetrating heat modalities upon the concentration of electrolytes. It will be observed that with diathermy the greatest or maximum heating takes places at a low concentration of the electrolyte, less than 0.1 per cent. In the case of radiothermy the concentration at which maximum heating takes place is only slightly higher. The third curve, representing electromagnetic induction, reveals a continual ascending curve which reaches the same degree of heat production as the other two at an electrolyte concentration of 0.85 per cent. This figure is near the physiologic concentration of the blood stream. With the electromagnetic field the heat will concentrate and seek the blood stream in place of the other tissues of lower electrolytic concentration which occurs with diathermy

or radiothermy. Further advantage is demonstrated since water and sweat accumulating at low electrolytic concentration will naturally be heated less by the electromagnetic field than by radiothermy or diathermy. The danger of skin burns is, therefore, greatly diminished. During electromagnetic induction the heat is produced by eddy current phenomena. This eliminates the dependency of the heat produced upon specific tissue resistance, as in the


RELATIVE HEATING
LESS VASCULAR OR MORE ADIPOSE TISSUES
MORE VASCULAR TISSUES
PHYSIOLOGICAL SALINE SOLUTION CORRESPONDS TO BLOOD-PLASMA IN CONDUCTIVITY
1 DIATHERMY (f = 550,000)
2 SHORT WAVE ELECTRIC FIELD (f = 10,000,000)
3 INDUCTOTHERM (f = 12,000,000)
CONCENTRATION NA CL SOLUTION

Graph 1. — Showing the comparative heating effect upon electrolytes in different concentrations by diathermy, radiothermy and electromagnetic induction. Note that maximum heating by induction occurs at 0.85 per cent (physiological) concentration as compared to 0.1 per cent with the other two. (After Merriman, Holmquest and Osborne.)



Graph 2. — Showing comparative vaginal, rectal and mouth temperatures produced by electromagnetic field and short wave diathermy of various wave lengths. (After Coulter and Osborne.)

case of diathermy, or to a lesser extent, the dielectric constant factor in radiothermy. Since, for example, the specific resistance of fat is nearly nineteen times that of muscle, it is not difficult to visualize how the adipose tissue could be cooked and still produce very little generalized body temperature when conventional diathermy is being used. In electromagnetic induction the fat is heated very little, because it is lower in electrolytic concentration.

Much comparative work between these three methods as applied to local tissue heating has been reported by Coulter and Osborne,[4] and Andreen and Osborne.[5] Its value to the fever therapist is obvious as will be seen by reference to graph 2. In all of these comparisons we have found the induction field more adequate in heating efficiency and quality.

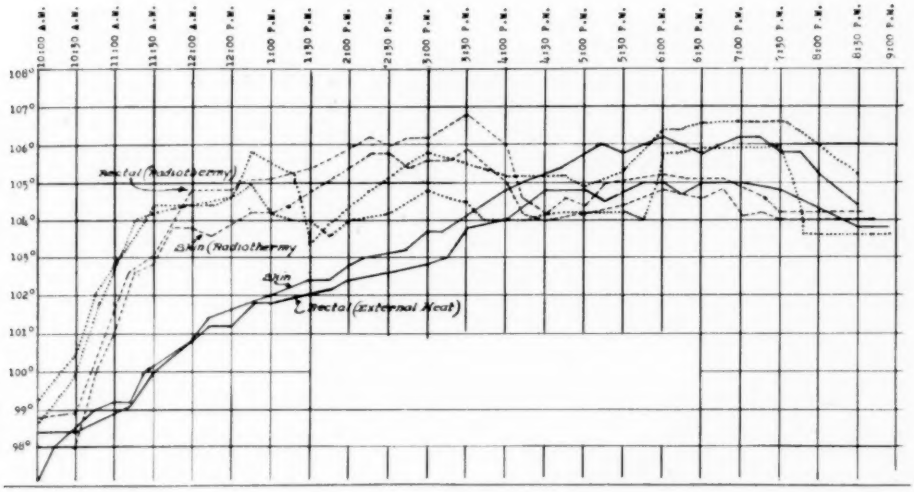
The other large group is comprised of apparatus which produce the fever by external or radiant heat. Most of them also depend upon electricity as their source of energy. To this category belong electric light bulb cabinets, electric blankets, various hyperpyrexators, vapotherms, infra-red hot packs, and more recently, the so-called air conditioned fever cabinets. It is obvious that they produce the fever by heating the skin to a point of supersaturation and maintain it at a higher temperature level than that of the deeper structures.

From the viewpoint of simplicity and economy it can be stated that external heat is probably the method of choice for fever production. On the other hand, as previously emphasized, these factors are entitled to only minor consideration in the selection of the proper method.

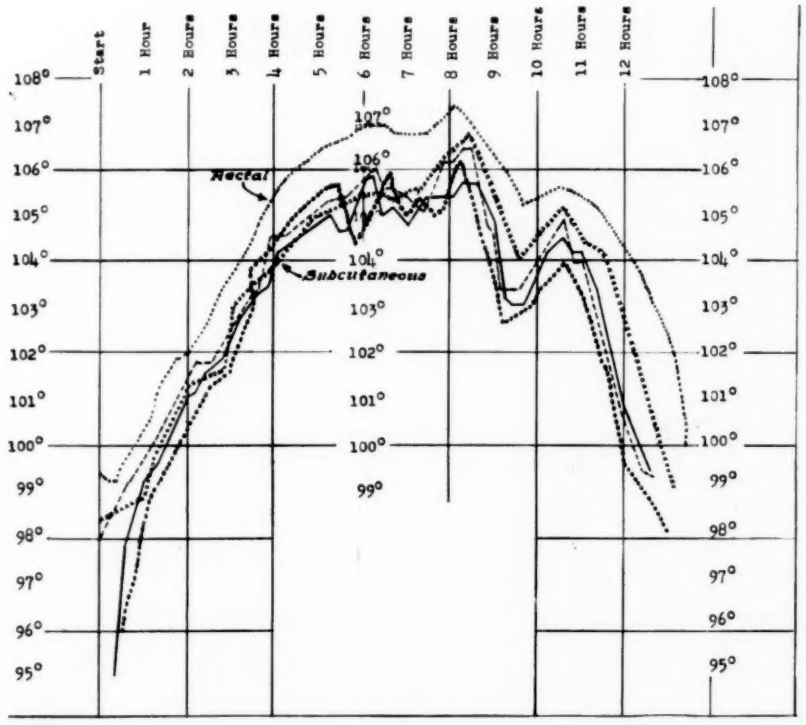
In the normal body the skin functions at a much lower temperature than the interior. Neymann[6] has shown that at normal rectal temperatures of 37.2 C. (99 F.) the skin temperature registers between 33.9 C. (93 F.) and 35 C. (95 F.). During spontaneous fever the skin always remains cooler than the internal organs. The normal physiology of the thermogenic regulating mechanism, already discussed, not only reveals this but emphasizes that this same gradient ratio should be maintained when fever is produced artificially. Probably the most widely used apparatus in this group today is the Kettering hypertherm. In order to reveal the mechanism of fever production by this method I quote from Simpson,[7] one of its originators.

> The mechanism of fever induction with the Kettering hypertherm depends primarily on heat transfer by conduction from the circulating heated air. This factor combined with prevention of the normal rate of heat loss from the body by radiation and evaporation is responsible for the elevation of the body temperature and its maintenance at any desired level. The average set of air conditions to which the patient's body is subjected is as follows: Dry bulb air temperature of from 130 to 150 F., relative humidity of from 35 to 50 per cent and air velocity of 425 cubic feet per minute.

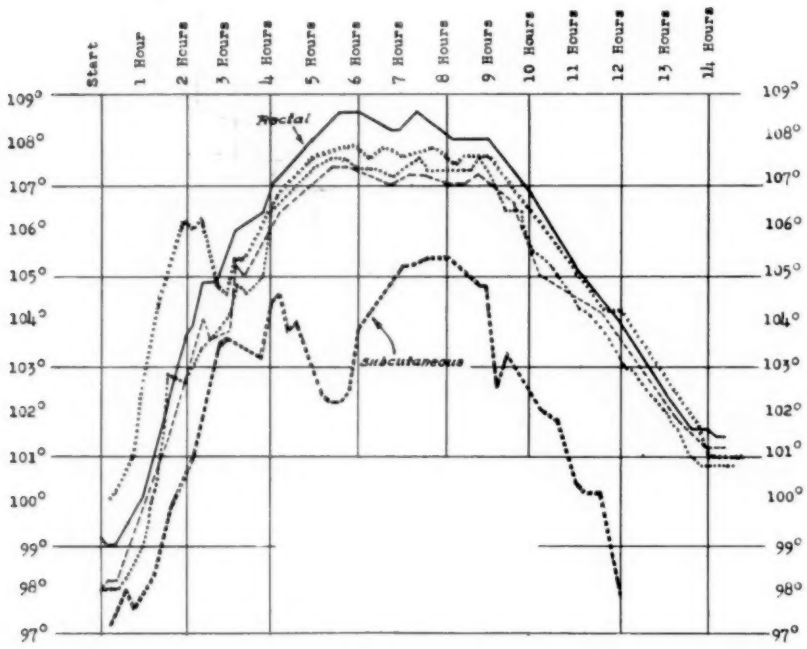
From the discussions at the Fever Conference by Dr. Simpson, it is my impression that he has developed a new technic which increases the saturation and lowers the temperature of the cabinet. I have not seen his new technic described, however, in his more recent writings. Further evidence regarding the physiology of this method can be obtained from a study of graphs 3, 4 and 5 constructed by Neymann and Osborne,[8] in which they have studied the actual comparative temperatures of the skin, subcutaneous lymph spaces and deep tissue structures, when the fever was produced by radiant heat as compared with penetrating heat. Confirmation is added by reference to graph 6 from Kendell, Webb and Simpson.[9] This work was carried out with the aid of thermocouples molded into the lumen of spinal puncture needles which were introduced into the tissues to be tested. From a strictly physiologic point of view one is justified in questioning the accuracy in detail, as some sensitive temperature changes could be conceivably effected by a change in the amount of blood coming to the needle point as a result of irritation. Benson and Bowman[10] have eliminated this factor by



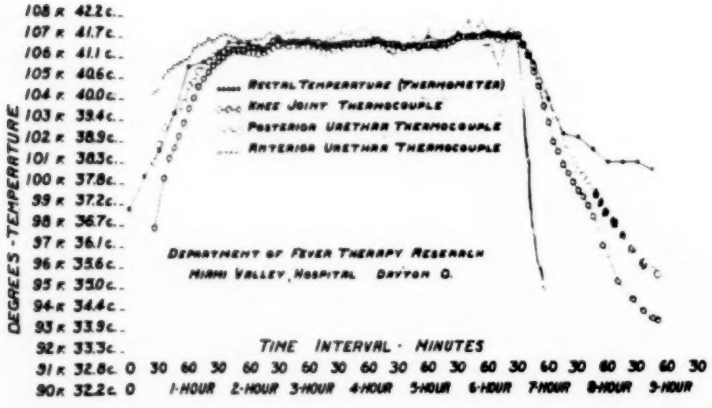
Graph 3. — Illustrating the difference between skin and internal temperature during fever produced by penetrating and external heat. Note that during external heat the skin temperature remains constantly higher than the internal temperature while with penetrating heat it remains lower. Key: ———— Electric Blanket; - - - - - Radiothermy; ..... Diathermy. (After Neymann and Osborne.)



Graph 4. — Illustrating the high degree of heat produced in the subcutaneous tissue (great lymph space) under external heat (electric blanket) as compared to penetrating heat in graph 5. Key: .... Rectal temperature, ———— Subcutaneous forearm, - - - - Subcutaneous abdomen, oooooooo Subcutaneous leg, and xxxxxxxx Axillary. (After Neymann and Osborne.)



Graph 5. — Illustrating the lowered degree of heat produced in the subcutaneous tissue (great lymph space) during fever produced by penetrating heat (Diathermy). The skin is cool and free to eliminate while the internal temperatures parallel each other. Key: ———— Rectal Temperature; x x x x x Lumbar Spine; ..... Cisterna Magna; ----- Axillary; - - - - - Subcutaneous. (After Neymann and Osborne.)


DEGREES - TEMPERATURE
108 F. 42.2 C.
107 F. 41.7 C.
106 F. 41.1 C.
105 F. 40.6 C.
104 F. 40.0 C.
103 F. 39.4 C.
102 F. 38.9 C.
101 F. 38.3 C.
100 F. 37.8 C.
99 F. 37.2 C.
98 F. 36.7 C.
97 F. 36.1 C.
96 F. 35.6 C.
95 F. 35.0 C.
94 F. 34.4 C.
93 F. 33.9 C.
92 F. 33.3 C.
91 F. 32.8 C.
90 F. 32.2 C.
RECTAL TEMPERATURE (THERMOMETER)
KNEE JOINT THERMOCOUPLE
POSTERIOR URETHRA THERMOCOUPLE
ANTERIOR URETHRA THERMOCOUPLE
DEPARTMENT OF FEVER THERAPY RESEARCH
MIAMI VALLEY HOSPITAL DAYTON O.
TIME INTERVAL - MINUTES
0 30 60 30 60 30 60 30 60 30 60 30 60 30 60 30 60 30 60 30
1-HOUR 2-HOUR 3-HOUR 4-HOUR 5-HOUR 6-HOUR 7-HOUR 8-HOUR 9-HOUR

Graph 6. — Thermometric gradient study in a patient with gonorrhea and gonorrheal arthritis of a knee joint. Rectal temperature was determined with a certified mercury thermometer at intervals of approximately fifteen minutes for nine hours. Temperature of knee joint, anterior urethra and posterior urethra were determined with thermocouples at intervals of five minutes. Rectal temperature was elevated to 105.6 F. in one hour. Temperatures of various tissues reached practically same level as rectal temperature during maintenance period, with exception of temperature of anterior urethra which was slightly higher during induction and maintenance period and exhibited fluctuations whenever skin surface of patient was cooled. Thermocouple temperatures were not recorded until twenty-five minutes after treatment was begun, due to mechanical difficulties. When rectal temperature had dropped to 100.5 F. posterior urethra temperature had dropped to 95.5 F.; knee joint temperature had dropped to 93.4 F. and anterior urethra temperature had dropped to 92.8 F. (After Kendell, Webb and Simpson.)

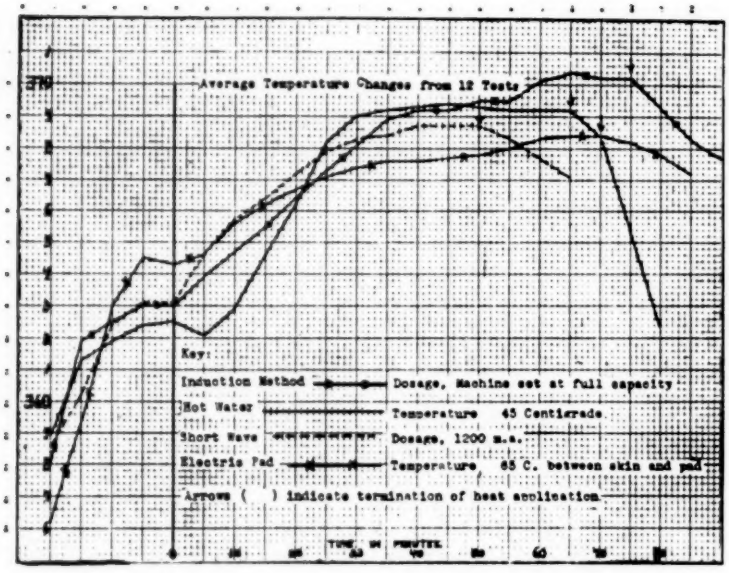
utilizing the temperature of the arterial blood peripheral to the point where the heat was applied. Their results are shown in graph 7.

Neymann and Holmquest[11] have shown that the total amount of sweat eliminated is diminished in fever produced by radiant heat. They attribute this decrease in part to peripheral capillary spasm and sweat gland paralysis due to excessive peripheral heat. Pyretotherapists in general have failed to consider another very significant physiologic factor. One of the functions of the scrotum is to equalize and maintain constant the temperature of the testes. We have been able to sterilize rabbits under radiant heat produced by incandescent light cabinets. Giles[12] reported similar experiences. This constitutes a possible medico-legal problem that few would care to sponsor.

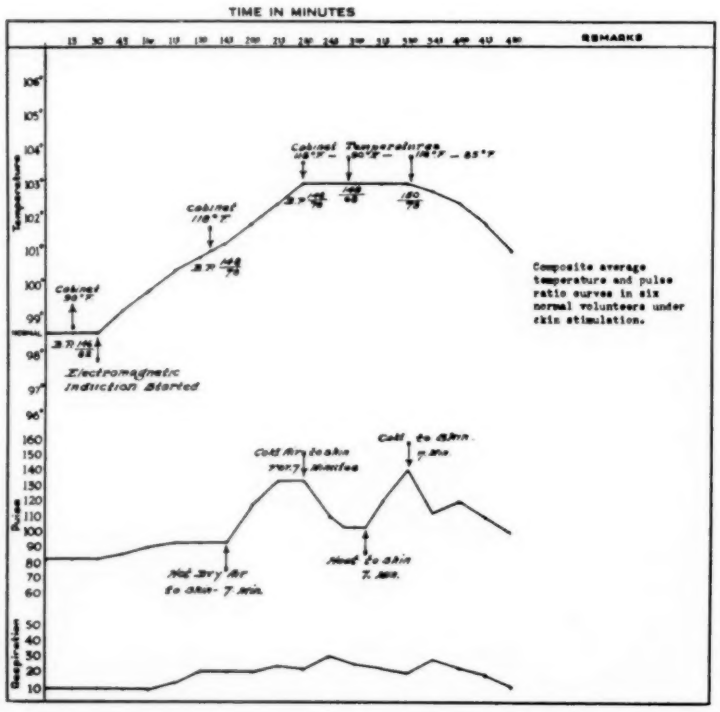
Cardiovascular Behavior

A discussion of skin function under the various methods of fever production is of no less significant concern than that of cardiovascular behavior. There are so many factors entering into the composition of electrocardiographic curves that it is questionable whether or not they are admissible as evidence of cardiovascular behavior during artificially produced fever. Especially would this seem to be true since in a number of studies the tracings tend to be predominant within nearly normal limits. There are, however, other measurable constants which contribute information as to circulatory function. From Desjardins, Stuhler and Popp,[13] using the Kettering hypertherm, I quote — "The pulse rate increases rapidly at the beginning of each sessio of treatment, that is, throughout the phase of rising temperature. Then the pulse rate tends to stabilize itself but the level of relative stabilization varies considerably." This and similar declarations from investigators using radiant heat were so foreign to our observations that we[14] instituted a study concerning this particular phase. Working independently, Benson,[15] in the physiologic laboratories at the University of Chicago, arrived at the same conclusion, viz., the heart rate was dependent upon skin temperature and was independent to a definite ratio hooked up with general body temperature. Both groups of investigators were of the opinion that thermal centres exist in the skin which act through reflex action upon the depressor nerves to the heart. Since the publication of our first graph,[14] there has been so much discussion that it was deemed wise to repeat the entire study under more accurate control. In the original experiments Benson used baths, while we employed ice and concentrated hot air from a pointed bellows. Justifiable criticism fell upon our method from the standpoint of skin shock caused by the sudden application of the stimulating elements, especially the ice.

Graph 8 presents the results of the second study carried out as follows: The body temperature is raised by electromagnetic induction, the magnetic field being incorporated into an air conditioned cabinet built by the General Electric Company which functions at a cabinet temperature of from 105 to 110 F. with a saturation of from 85 to 90 per cent. In our particular cabinet they constructed for us sliding apertures on both sides. Placed outside on one side is a large cake of ice in a receptacle over which a current of air is blown by a large fan. The air is admitted to the skin surface of the patient at will by opening the slides. On the other side is placed a large combination electric heater with a fan incorporated in its unit. Likewise, this heat can be applied at will. The body temperature can be kept constant by virtue of the fact that the fever apparatus is attached from the foot of the cabinet and can be kept at constant capacity during the other manipulations. The relationship between skin temperature and heart rate is perfectly obvious by reference to the graph. In defense of this work against much conscientious clinical disagreement, we particularly emphasize that such a study of normal


Average Temperature Changes from 12 Tests
Key:
Induction Method — Dosage, Machine set at full capacity
Hot Water — Temperature 45 Centigrade
Short Wave — Dosage, 1200 m.a.
Electric Pad — Temperature, 65 C. between skin and pad
Arrows ( ) indicate termination of heat application

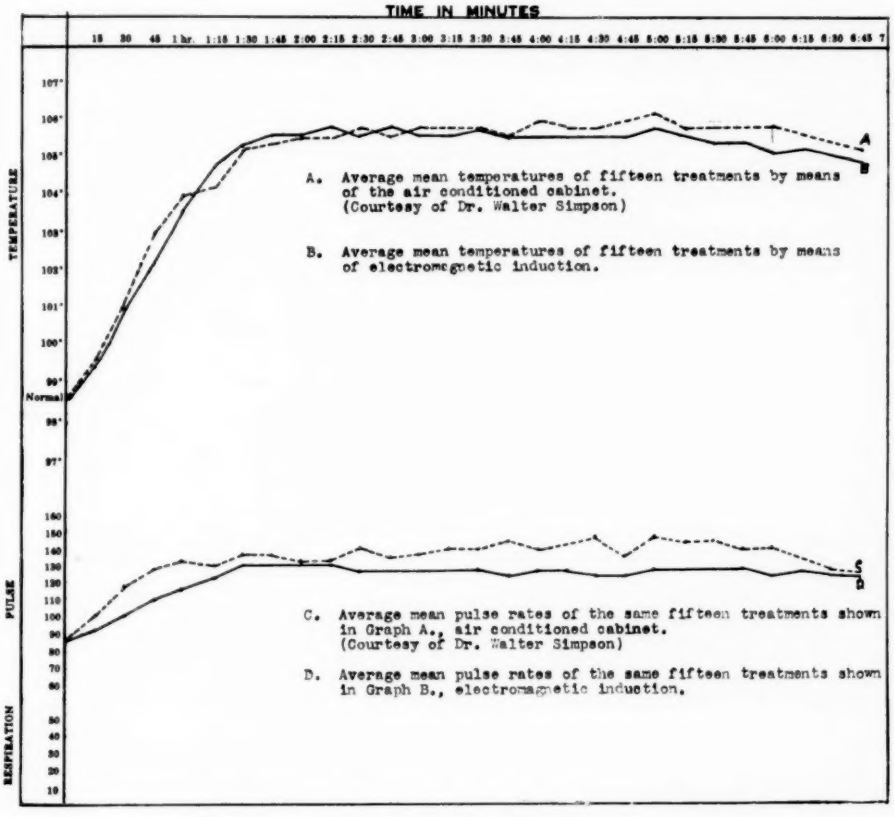
Graph 7. — Legend incorporated in chart. (After Benson and Bowman.)



Graph 8. — Showing direct relationship between pulse rate and skin temperatures. Note the independence between heart rate and the general body temperature.

physiologic constants was properly carried out upon normal healthy volunteers. Secondly, that the experiments were executed under conditions of normal ratio gradient between skin and internal temperature and not under conditions of radiant heat where the skin is being baked and all centres in

a possible unphysiologic state of paralysis before the experiment was even started. Schmitt, Holmquest and Marshall[17] have studied the maximum, mean and minimum pulse ratio in a series of 200 consecutive treatments by electromagnetic induction. The curves resulting from 74 of these are shown

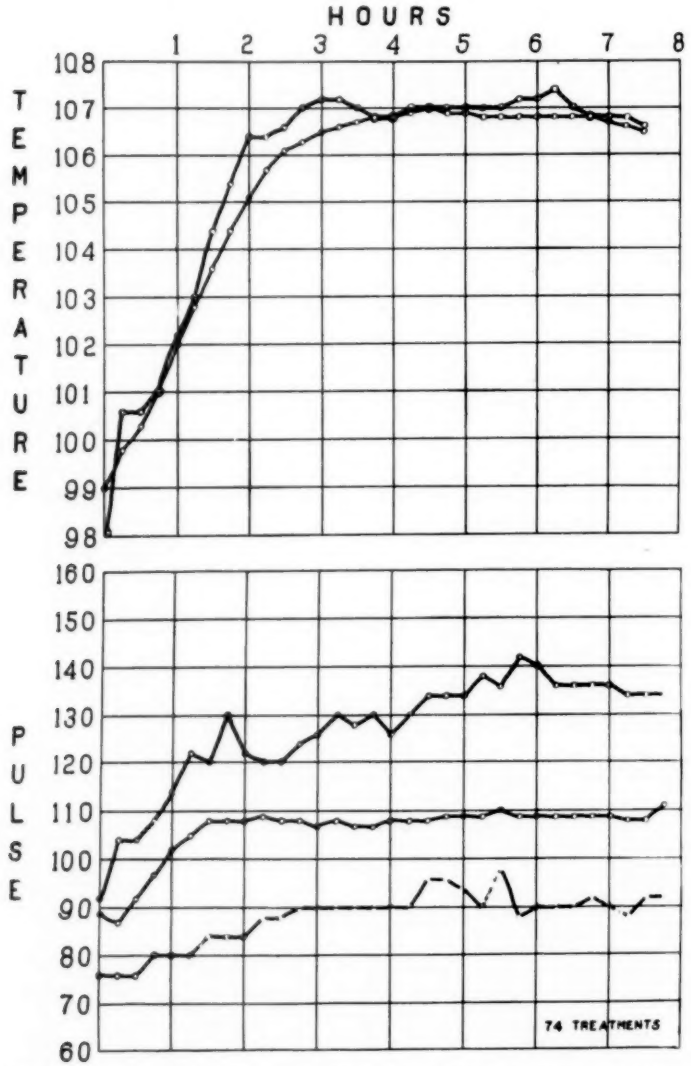

TIME IN MINUTES
TEMPERATURE
PULSE
RESPIRATION
Normal
A. Average mean temperatures of fifteen treatments by means of the air conditioned cabinet. (Courtesy of Dr. Walter Simpson)
B. Average mean temperatures of fifteen treatments by means of electromagnetic induction.
C. Average mean pulse rates of the same fifteen treatments shown in Graph A., air conditioned cabinet. (Courtesy of Dr. Walter Simpson)
D. Average mean pulse rates of the same fifteen treatments shown in Graph B., electromagnetic induction.

Graph 9. — Comparison of pulse rates obtained by an air-conditioned cabinet and electromagnetic induction. (After Neymann.)

in graph 10. The average pulse rates are seen to be much lower than those reported by investigators using radiant heat.

Reference to a recent report by Wilbur and Stevens using radiant heat will show in their tables blood pressure dropping from 150/90 to 90/40 and 106/56 to 72/15 during treatment; also, pulse rates increasing from 80 to 160 and from 88 to 170 during treatment. I must again emphasize that such fluctuations are entirely foreign to workers using electromagnetic induction. Graph 9 by Neymann reveals the distinct difference in pulse average between his cases under electromagnetic induction and those of Simpson under Kettering hypertherm. Circulatory collapse, extreme exhaustion, skin burns, subcutaneous fat coagulation, convulsions and scores of other tragedies so common during the pioneer days can all now be safely eliminated with proper selection of apparatus and properly trained and skilled personnel. Yet discussions are replete with ventured opinions that the modality makes little or no difference. This dangerous and unscientific attitude can never survive.

From a detailed study of the various reports dealing with biochemical and other physiologic changes in the blood, urine and sweat, there exists a rather wide variation and dispute. How much of this is due to the specific



Graph 10. — Composite maximum, mean and minimum temperature and pulse curves from 74 to 200 consecutive fever treatments by electromagnetic induction. (After Schmitt, Holmquest and Marshall.)

apparatus inducing the fever is still problematical. Opinions that heat is not the sole factor are rapidly gaining recognition and headway.

Certainly from a physiologic point of view it can be stated that the ideal apparatus for producing fever by physical means is as yet non-existent. The pioneers of fever therapy, in America at least, are practically in agreement that skill and special training are essential. Simpson has often truly stated that a skilled operator is safer with a bath tub than an unskilled operator with the best fever apparatus we have today. This analysis will aid the neophyte in choosing what is at present safer and more near the ideal.

Conclusions

The following conclusions seem justifiable:

(1) That penetrating heat is physiologically superior to radiant heat;

(2) Short wave electromagnetic induction is probably the choice of the penerating heat group;

(3) If air conditioned cabinets are used in conjunction with penetrating heat, the cabinet temperature should be relatively low, 105 F. to 110 F., and the saturation high, 85 to 90 per cent;

(4) The normal physiologic heat regulating mechanism should be preserved as much as possible in the selection of apparatus.

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ADVANCES IN THE PROPHYLAXIS AND TREATMENT OF FOOT DISABILITIES *

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AND

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The painful foot and leg constitute a problem in medicine which both general practitioners and specialists find difficult to cope with, although myriads of excellent articles and textbooks have been written on the subject. The patient expects advice, a prescription or a mechanical support which is entirely safe and satisfactory, because he does not realize the underlying pathologic process which has caused his troubles. The physician is aware of many of the possibilities which cause pain in the leg, foot and back. Pathologic changes in many different structures may be responsible—bones, joints, ligaments, nerves, muscles and the blood or blood vessels. Or the complaints may be the consequence of a systemic disease. Thorough examination must be performed, the correct diagnosis established if possible, and the therapy outlined accordingly. In the past the results of treatment in many cases of pain of the lower extremities have been poor because of neglect of these very details. Thousands of people complain of foot pain, and thousands of mechanical arch supports are made and later disappointedly discarded. Even surgery has frequently left much to be desired. These patients with their complaints of pain in the back and lower extremities frequently fall into the hands of the irregular practitioner. The physician is frequently embarrassed when he hears that some "bone-setting" operation, "adjustment" or simple exercise has accomplished relief where his own treatment has failed. All physicians understand that massage, manipulation and corrective exercise form an important part of physical therapy, but few ever take full advantage of these valuable measures. In recent years the development of machinery has pushed older procedures into the background, at the same time furnishing a questionable substitute for them. For several years we have been interested in and questioned in detail many of the disappointed patients mentioned above.

Preventive and Corrective Exercises

We wish to present here our observations in certain types of cases and to describe the treatment which has produced better results. This paper cannot cover the entire subject of foot correction, so that we will limit its scope to some of the newer developments and will not describe here the ordinary methods of treatment which are now in everyday use. We have observed that relatively little attention is paid to the condition of the musculature of the legs and foot. Nearly all pathologic conditions of the bones and joints, whether acute or chronic, static, inflammatory or traumatic sooner or later lead to complications involving their musculature. The reverse is also true. These are the elements which lead to findings of painful fibrositis, muscle imbalance, postural defects and the host of ailments which accompany these conditions. Postural defect may precede any evidence of fibrositis, which may then be considered a secondary factor. Frequently the first

* From the Physical Therapy Department of the Hospital for Joint Diseases, New York.
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evidence of a weakening foot is muscular imbalance. The degree of weakening may be so slight that it is at first overlooked. Sometimes the foot deformity may be overcome and corrected without elimination of the original muscle imbalance which remains and causes either local or referred pain. Posterior muscle groups of the legs very frequently show a tendency to shorten. To the best of our knowledge nobody has as yet described this occurrence as a distinct entity. Our interest in this problem was aroused many years ago by Dr. Jacques C. Rushmore, of the Long Island College Hospital. Sometimes the cause of this shortening is evident, such as the use of exceptionally high heels. Frequently the cause remains obscure. It is possible that this is another of the penalties we pay for standing erect, a position to which the human body is not yet fully adapted. Tight posterior muscle groups of the legs can be shown to be the cause of many painful conditions which could hardly be explained otherwise. We have seen patients who complain of obscure pain in the lower extremities, the hips, the lower back, the shoulders and even some with pains referred down both arms. When no other cause of these pains could be found by clinical or laboratory examination the possibility of tight posterior muscle groups was investigated. In some cases we determined definite tenderness or spasm in the suspected muscles. In the majority of cases examination by the methods to be described showed the presence of tightened muscles.

Special Remedial Measures

The therapy of this condition is a very simple one both in theory and practice. The patients are taught to perform certain exercises twice daily regularly and faithfully for the purpose of stretching the tight muscle groups. For the lower posterior muscle groups of the legs the patient stands without shoes facing the wall and with the toes about six or eight inches from it. Both hands are placed on the wall at about shoulder level. The toes and heels must remain firmly on the floor and the knees in full extension. Now the patient arches the back and presses the hips forward until they touch the wall, with the heels still firmly on the floor and the knees fully extended. The erect position is then again assumed by pressing the shoulders backward and straightening the back. The exercise is repeated several times, the number of movements and the distance of the toes from the wall being gradually increased. The same effect can be obtained with the assistance of the operator by having the patient seated opposite and placing his heel on the operator's knee. The patient flexes his own knee and puts both hands firmly on it, and while the operator firmly dorsiflexes the foot the patient extends the knee by pressing down on it. This maneuver also serves as an excellent test for tight lower posterior muscle groups.

To stretch the upper posterior muscle group the patient places one heel on a chair with the knee extended and then bending forward tries to reach his toes with a hand of the same side. This may be very difficult at first. The patient later is taught to perform this exercise in the same position but with the hands placed on the hips. This makes the stretching of the upper posterior muscle groups even more strenuous. These exercises must be performed twice daily, each movement being repeated from four to twelve times. This same exercise may be used as a test for tightness of the upper posterior muscle group, or we may use the straight leg raising test. In this the leg is raised while the patient lies flat on his back with the knee fully extended. Any undue tension in the upper posterior muscle group will quickly become apparent.

We have observed that with these simple exercises when performed regularly many obscure and often remote symptoms clear up. The use of

exercises in the treatment of weak and pronated feet has been emphasized repeatedly in the literature. Many authors today agree that the mechanical arch support is little more than a crutch for the foot; a very necessary one in the beginning to correct the deformity, relieve pressure and to put the foot at ease, but as early as possible correction of the underlying causes of the trouble must be initiated. Still better of course would be the prevention of these factors before they have developed. Special exercises have been devised for this purpose. All aim at strengthening of the adductors and plantar flexors. Whitman wants the foot to "be adducted and inverted, then dorsiflexed in the attitude of slight adduction over and over again at every opportunity."

Supination exercises with the feet in slight adduction and walking on the outer border of the feet is recommended. The chief cause of failure to produce a good result by these exercises will be found in the negligence of the average patient. It will be necessary to teach the patient the importance of faithful performance, and failing to obtain cooperation it will be necessary to have the patient exercise under supervision.

Artificial Pebble Beach

In the case of young children we must not expect full cooperation, and other means must be found to ascertain that the exercises will be properly performed. It has been frequently mentioned that walking barefoot on rough ground or on a sand or pebble beach be recommended for the prevention and treatment of weak feet. It has been observed that irritation of the tender sole of the foot tends to throw the foot into just the position desired, namely adduction, inversion and supination. Frequently when foot strain has been experienced we seek relief by throwing the foot into the same position.

In re-educating the weak or deformed foot attention is always paid to the proper gait of the patient. We are mindful of the fact that an improper gait very frequently leads to development of a weak foot or of a foot deformity. It is claimed that the foot of the infant remains comparatively flat until the end of the first year. Only in the second year does the arch begin to develop. As soon as the child starts walking it therefore becomes desirable to stimulate the function of the arch-supporting musculature. Nature's plan to accomplish this involves our walking barefoot on rough ground. Civilization has bestowed on us the shoe and the smooth pavement and floor. I think we will all agree that the average man wears improper shoes from childhood on and many foot disabilities can be traced to this fact. For a long time the physician has recommended all manner of exercises for the child to prevent the development of weak feet. Roberts states that much can be accomplished by teaching the child to walk on its toes and by devising simple games that will bring this attitude into play, thus helping to develop the proper muscles. He also recommends an exercise to consist of rising on the toes and coming slowly down on the outer borders of the feet. But at an early age it is difficult to carry out such muscle training effectively. Not every individual whether child or adult, frequently has the opportunity to walk over irregular ground.

In this connection we wish to present the novel contribution by Blumenthal, who has devised a very simple apparatus to furnish an excellent substitute for a pebbled beach. He constructed a mat made of cloth or rubberized material quilted in squares. Each square is loosely filled with a mixture of cork, pebbles or other rough material. Dr. Blumenthal has observed that with the patient walking on the smooth floor each step resembles

the other, giving very little exercise or variation to the muscular movement. On the rough surface of the mat, however, each step is different. We have verified Dr. Blumenthal's observations and have been impressed by the results. The accompanying illustrations (figures 1 to 3) fully explain the manner in which the use of artificial measures aids in overcoming typical weak foot position. They show not only the equipment employed, but the position of standing on a smooth surface as a contrast to that obtained when walking on a special correction mat.

A B

Fig. 1. — *A*, patient standing on a smooth surface. Note typical weak foot position. Pronation of the foot shown on the left, with dropping of the longitudinal arch on the right; *B*, same patient standing on the mat in a position with feet in supination and the transverse and longitudinal arches raised without having as yet assumed the desired internal rotation of the leg.

A B C

Fig. 2. — *A*, patient walking on the mat. The left foot is held in excellent position except for external rotation. The right foot is slightly pronated; *B*, position assumed by the patient standing on the mat. The legs are in internal rotation with the feet supinated and the longitudinal arches well raised; *C*, patient now holds his foot in the desired position which produces the greatest comfort.

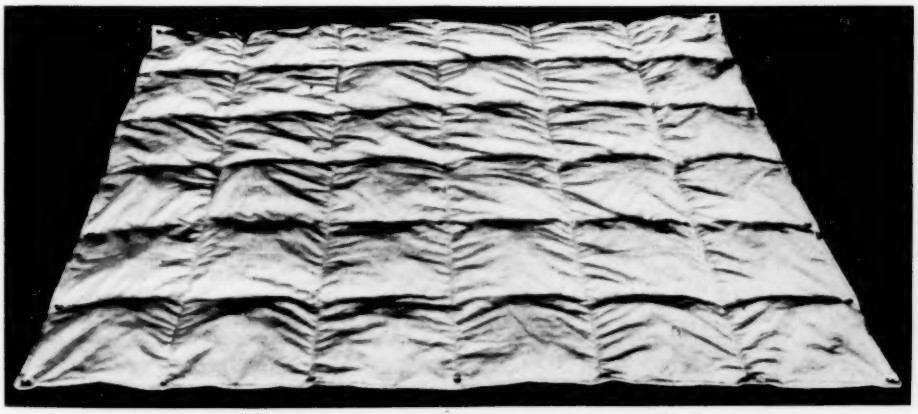


Fig. 3. — The mat.

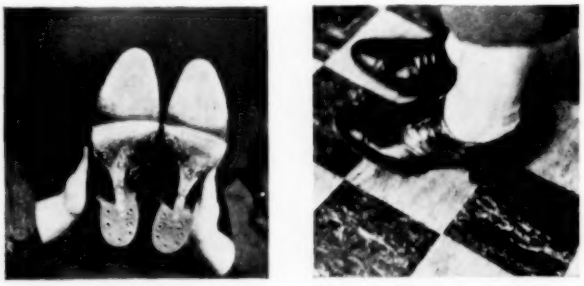
This mat can be used in the play-pen of the infant so that his earliest steps will be on the rough surface. Both for the infant and older patients it is best to gradually increase the time that the mat is in use. This must be graduated just as would be any other exercise.

Weiss Heel

We would like to call attention to two additional devices which we have also found very helpful in the treatment of these difficult cases. One of these is a modification of the well known extended Denver heel. In this heel the space below the shank of the shoe is filled with leather. This prevents breaking down of the shank which is so often observed. Considerable comfort is obtained in certain types of metatarsal pain, stubborn or recurrent metatarsal verruca and hallux valgus. However, the amount of material required makes the shoe heavy and unsightly. We have attempted to overcome this drawback without sacrificing the support of the shank. This is accomplished by tapering the filled portion back from a broad metatarsal step to a narrow strip at the heel as shown in figure 4, *A*.

This device has become known to the trade as the Weiss heel and unless otherwise specified will be furnished with a step of 1/8 to 3/16 in. depending upon the size of the shoe.

Because of the taper of the filled portion it is hardly noticeable when the patient stands or walks, even with a shoe having a moderately high heel, as is seen in figure 4, *B*.



A B

Fig. 4. — *A*, the Weiss heel; *B*, appearance of shoes in walking.

The relief obtained from this devise is more constant than that seen following the use of the simple metatarsal bar or the usual Denver heel.

Another device which has given encouraging results in the treatment of the pronated foot is the leather heel brace which has been developed by a Brooklyn brace maker in collaboration with several orthopedic surgeons. Although the device closely resembles the average so-called arch support the point of support is much further back toward the heel. Its chief function is to supinate the heel rather than the tarsus. Relaxation and supination of the tarsus follow naturally. The heel brace is very light and of all leather construction. The average patient should not be permitted to wear the heel brace for more than a single hour the first day, the time then to be gradually increased. The relief obtained in painful weak feet and the anatomic correction is spectacular in many cases.

When we consider the seemingly unrelated factors which enter into the causation of remote bodily complaints, we are reminded again that the physical therapist must be a physician and moreover one who is prepared when occasion arises to invade the territory of the other specialties.

(Concluded on page 498)

STATUS OF IONIZATION IN NASAL ALLERGY *

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The current literature on nasal ionization does not permit definite conclusions because of inadequate statistics, especially concerning the comparative value of ionization and of allergic methods of therapy. The present discussion, therefore, while evaluating the various methods of treatment for nasal allergy, will take into consideration the selection of cases and their results.

The treatment of nasal allergy and other conditions characterized by intumescence or hypertrophy of the turbinates (especially the inferior) by the local application of chemicals or electrical methods, has been employed for a long time. In non-allergic conditions characterized by swelling of the turbinates methods have been used which produce shrinkage of the tissues. The first methods employed in the treatment of the inferior turbinates consisted principally of chemical cauterization, electrocauterization and the surgical removal of parts of this structure. As long ago as 1905, a monograph on the electrical methods was published by Neiswanger.[1] More recently, diathermy has been advocated by Massey[2], Beck[3], Fuchs[4], Hurd[5], Morrison[6], Hollender[7-8-9-10-11-12] and Schliephake[13].

Review of the Literature

Ionization in the treatment of nasal hydrorrhea and other nasal conditions was reported as long ago as 1898, by Baber.[14] Previous to 1927, ionization was not extensively employed, but since that time it has come into more general use in the treatment of nasal allergy, sinusitis and chronic conditions characterized by enlargement of the turbinates. Ionization in the treatment of maxillary sinusitis has been reported by Friel,[15] Fox,[16] and Reese.[17] McCoy[18] recommended it in chronic ethmoiditis. Ionization in the treatment of non-allergic conditions in the nose has been reported by Norrie,[19] Feldman,[20] Harris,[21] Gale,[22] Hollender,[23,24] Sputh,[25] Sinskey,[26] and Stovin.[27] During the past decade, and especially during the past four years, observations on ionization in allergic conditions have been reported by Demetriades,[28] Thomson,[29] McCurdy,[30] Campbell,[31] Franklin,[32-33] Cahill,[34] Hollender,[12-23-24] Warwick,[35] Alden,[36-37] Haseltine,[38] Hurlbut,[39] Cottle,[40] Hays,[41] Tobey,[42] Bryant,[43] Volk,[44] Bernheimer,[45] Hurd[61] and others.

Different chemical solutions have been used as electrolytes. In 1927 Demetriades reported calcium sulphate, while Franklin, of London, utilized a one per cent solution of zinc sulphate. In 1934 Warwick advocated a solution containing a combination of zinc, tin, and calcium as the electrolyte. During the past three years this type of solution has been generally employed as the standard.

Effects on Tissue

A number of observations have been made regarding the possibility of the penetration of metallic ions into the tissues. According to Lierle and Sage,[46] experimental ionization of the ears of animals showed after

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chemical and spectroscopic examinations that metallic zinc does not penetrate the tissues in the process of ionization. Wenner,[47] however, has shown that metallic zinc does penetrate from one side of the ear to the other in the rabbit. Metallic zinc was demonstrated throughout the thickness of the cartilage and extended into the skin of the opposite untreated side. Wenner further states that the immediate effect produced on the nasal mucosa by ionization is local acidosis and dehydration of the tissues. In a further series of experiments Wenner and Alexander[48] noted the effect of zinc ionization and the galvanic current on the reaction of the nasal mucosa to vasomotor drugs. Their studies showed that changes in the nasal mucosa following zinc ionization do not hinder the absorption of vasomotor drugs instilled into the nasal cavity. The blood vessels and the cavernous tissues of the nasal mucosa failed to react to vasoconstrictor and vasodilator substances for six weeks after zinc ionization and four weeks after treatment with the galvanic current. It is believed that this failure of the vascular structure to contract or dilate is due to temporary paralysis of the vasomotor nerves or to a loss of vascular tone. Histologic studies of the blood vessels, however, showed no thickening or other pathologic changes in the walls of these structures that might account for this temporary disturbance of the vasomotor mechanism.

The effect of ionization of the mucosa of the frontal sinuses of dogs was recently studied by McMahon,[49] who used substances as India ink in saline solution, 10 per cent neosilvol, 10 per cent argyrol, and 2 per cent zinc sulphate solutions. The gross and microscopic findings after ionization were tabulated. It was found that the principal reactions of the mucosa to the silver colloids was cytologic. There was localized leukocytosis which was not any more pronounced as a result of the ionization or any less pronounced without ionization. In other words, McMahon states that an ionizable solution may react spontaneously to the electrified forces of the sinuses themselves upon sufficient contact and thus enable the constituent ions to penetrate into the mucosa and cause an appropriate reaction. According to this hypothesis, as far as the local tissue reaction is concerned, ionization has no advantage over a passive contact within a cavity lined with mucous membrane. Histologically, it was observed that destructive changes may be brought about as a result of zinc ionization. These were characterized by a marked fragmentation of the epithelium, edema of the subepithelial tissues and subepithelial hemorrhages.

McMahon[50] later performed a series of experiments on dogs to determine the nature of the regeneration of the mucosa following ionization. The electrolyte used was composed of zinc, tin, and cadmium. The electrode was wound with cotton, soaked with the solution and introduced into the nose. Two and five-tenths milliamperes of the galvanic current were used for 20 minutes.

A specimen of nasal mucosa removed from the dog 18 hours after ionization showed a granular fluid in the protoplasm and also vacuolization in the epithelium. There was fragmentation of individual and large blocks of cells. Round cells appeared in large numbers infiltrating to the surface from the subepithelial tissue. Fibrosis of the subepithelial tissues was well established in those dogs killed seven weeks following ionization. Ionization of the frontal sinuses caused a similar fibrosis in dogs killed after 7 to 12 weeks; marked hyperplastic bone changes occurred in the dogs killed after 12 weeks. The epithelial changes in the nose consisted of a primary destruction and subsequent regeneration practically to normal; while in the frontal sinuses there occurred an eventual transition to a cuboidal type over the areas of greatest destruction.

A series of experiments with nasal ionization in animals was also conducted by Wenner.[47] Guinea pigs, dogs, and rabbits were used. More constant findings were noted in the guinea pig than in the other animals. Within one week after ionization, the changes in the epithelium were characterized by metaplasia and hyperplasia. Similar changes were found in dogs three months after ionization. There was no regeneration of the cilia. Grossly, the nasal mucous membrane appeared dry with a scanty amount of secretion. In dogs the epithelium showed evidence of keratinization of the stratified squamous type. In the subepithelial tissues the gland ducts appeared dilated and the glands themselves slightly atrophied. Thickening of the blood vessels was not pronounced. The cavernous spaces, however, appeared smaller.

Hollender,[15] however, reports that following ionization in man, ciliated epithelium is replaced by a nonciliated cuboidal or stratified type. The degree of fibrosis in the subepithelial tissue has not been found to an appreciable degree. Bernheimer[45] states that the histologic effects of ionization do not differ from those resulting from the application of escharotics. In neither case did he note marked evidence of fibrosis.

Histopathologic Studies

In a group of 20 cases consisting of perennial nasal allergy and seasonal hay fever in which the mucous membrane was subjected to ionization of a solution consisting of zinc, cadmium and tin, we[51] have made gross and microscopic studies of the exudates and tissues. The immediate effect of the ionization was the production of a serofibrinous exudate which completely filled both nasal cavities. The exudate remained in place for about four or five days, when it was removed with forceps or became dislodged. The microscopic examination of the exudate 24 hours after the ionization showed a small number of eosinophiles and neutrophiles. The exudates examined at the end of four or five days showed both by smears and by microscopic sections a dense infiltration with neutrophiles, a few scattered eosinophiles and also strips of epithelium.

Following the complete disappearance of the exudate, the nasal mucous membranes exhibited a dry appearance with scanty secretion. The membrane appeared to be in a state of vasoconstriction. There appeared to be a lack of the normal amount of secretion. During the subsequent period of relief, the mucous membrane appeared to retain these characteristics; the amount of secretion was scanty and returned to normal very slowly. Immediately after the extrusion of the exudate, that is, in about five or six days, the secretion showed large numbers of neutrophiles and eosinophiles. During the subsequent week or ten days, the secretions gradually became clear and the neutrophiles disappeared, but the eosinophiles again appeared in large numbers as before the ionization treatment. The examination of polypoid tissue at various stages following the ionization revealed about the same cellular reactions shown by the secretions. Polypoid tissue removed two or three weeks after ionization presented definite evidence of necrosis in areas apparently subjected to the direct effects of treatment.

From these observations it appears that the immediate effect of ionization is the induction of an acute inflammatory process which subsides within about ten days to two weeks. The demonstration of the presence of eosinophiles in the secretions during the period of relief following ionization indicates that allergic reactions may take place, but not of sufficient degree to produce symptoms.

Mechanism of Relief

There has been considerable speculation as to the mechanism of relief following ionization of the nasal mucosa. There are at least two possible explanations: Satisfactory results appear to be the effect of a local or even a general nonspecific desensitization; or improvement is due to a shrinkage of the tissues from prolonged constriction or paralysis of the blood vessels rather than shrinkage from fibrosis. According to Alexander,[52] local nonspecific desensitization appears to be similar to that obtained by the use of carbolic acid, trichloracetic acid, diathermy, or the actual cautery. Testing the nasal mucosa before and after ionization has shown that in certain cases temporary or prolonged loss of sensitivity takes place. The relief of symptoms on both sides of the nose following ionization of one side, or the relief of other accompanying manifestations of allergy would suggest a nonspecific general desensitizing effect perhaps similar to that obtained by vaccines or other nonspecific foreign protein.

That a general desensitizing effect may be obtained from ionization is well illustrated in a recent report by Chajutin.[53] He treated a group of 17 patients with so-called vasomotor rhinitis by calcium iontophoresis applied not to the nasal mucosa but to the skin over the shoulder. Thirteen of the 17 patients were completely relieved and had no subsequent attacks for more than a year. Four were partially relieved. The ionization was performed with tinfoil electrodes of 160 sq. cm. placed in front and behind the shoulder. A flannel pad soaked with a two per cent solution of calcium chloride was placed under the anode and a flannel pad soaked in water or salt solution under the cathode. A tourniquet was applied above the electrode to produce hyperemia. A current of 40 ma. was given for 20 minutes, with two interruptions to reduce the resistance of polarization. The patients received several courses of treatment over a period of one month, which were repeated at the end of six months, for the effect was found to last only that length of time.

In order to determine any possible changes in the degree of sensitivity of the nasal mucosa before and after ionization, Dean and his coworkers[54] used the mucosal test. In one case a positive mucosal scratch reaction was obtained to ragweed before ionization, and 14 days after ionization there was a negative reaction. A passive transfer test with the patient's serum showed a doubtful reaction to ragweed. In another case good intramucosal and intracutaneous reactions were obtained to orris root before ionization. Two weeks after ionization, retesting showed these reactions still to be positive. Nineteen days after ionization, however, both tests were negative. No reagins were demonstrable in the patient's blood serum. In a patient giving a positive reaction to ragweed, goose feathers, and mixed nuts, it was found that two weeks after ionization the reactions were positive to goose feathers and ragweed but negative to mixed nuts. Passive transfer tests for these three substances showed doubtful reactions. In a case of hay fever a strong positive reaction to ragweed was obtained before ionization treatment and also one month after treatment.

In a series of cases in which operative procedures had been performed on the nose, mucosal tests were also performed. In one instance a patient who showed positive mucosal reactions to ragweed and white flour continued to show the same positive reactions 20 days after a Caldwell-Luc operation. In another case, a submucous resection of the septum failed to produce any change in the positive mucosal reactions obtained to ragweed, house dust, feathers and bananas.

By means of intranasal swab tests with serial dilutions of pollen extracts Vistreich[55] noted that the treatment produced an actual decrease in the sensitivity of the nasal mucosa to pollen. By periodic testing it was found that this state of relative insensitiveness is not permanent. The average duration observed in this series was approximately seven to eight weeks.

Similar immunologic observations were made by Alexander.[56] It was found that soon after the mucosa became normal in the patients who were relieved, the topical application of the allergen caused little or no reaction, whereas previous to ionization it had had a violent effect. In patients, however, who had demonstrable reagins in the blood and who, in general, obtained poor results, the mucosa became resensitized within a short time and reacted as before to topical applications. It was found that patients without reagins remained insensitive as a rule for longer periods of time. It was noted that nasal ionization had no effect on the skin reactions or upon the reagins in the blood.

From the clinical standpoint, Alexander states that hay fever patients ionized before the season do poorly. If treated during the season, success is measured largely by the duration of the season after the date of treatment. If treatment is administered near the end of the season and its effect wears off after the season is over, it has the appearances of a virtual cure. Alexander is convinced that in the majority of cases hyposensitization with pollen extracts appears to be the superior method of treatment. Alexander noted that among three patients with hay fever who were ionized, the nasal symptoms disappeared but asthma occurred for the first time. Parlato[57] also reported the development of asthma for the first time following ionization in two hay fever patients. In cases of nasal allergy with a marked degree of hypersensitiveness as shown by positive skin reactions and the presence of reagins in the blood, relapses occurred. In the group of patients, however, with negative skin tests and an absence of reagins, nasal ionization proved to be very effective. It appears that it is this group in which ionization seems to be indicated. Alexander finally concluded that clinically ionization is an inferior form of treatment for hay fever, asthma and other allergic conditions, with the exception of certain cases of vasomotor rhinitis without established cause.

In the discussion of the above report, Ramirez[58] gave his observations on nasal ionization in 100 cases of seasonal pollinosis and 25 cases of perennial allergic rhinitis. The results in all 100 patients were unfavorable.

The patients were divided into various groups. Some were treated several weeks before the onset of the hay fever season, some immediately before and some during the season. Results were also uniformly unsatisfactory in the so-called nonallergic patients in whom the etiologic factors could not be determined.

The results obtained by nasal ionization in the treatment of a group of 20 patients were also reported by House and Gay[59]. These patients included 8 with hay fever and pollen asthma; 3 with allergic rhinitis; 4 with perennial non-allergic rhinitis; 2 with asthmatic bronchitis of bacterial origin; and 3 with allergic bronchial asthma. Each patient was thoroughly studied before treatment and each was a typical example of the group represented.

Of the 5 nonallergic patients, 3 were improved, 1 was unimproved and 1 was worse. Of the 15 allergic patients, 3 were improved, 7 were unimproved, and 5 were worse. According to these observations, some benefit was derived in the nonallergic group, but the treatment was of no benefit in the allergic group; in fact, many of the patients who became worse de-

veloped asthma following the treatment. House and Gay conclude that in conditions of hypersensitiveness, this method of treatment should be given no consideration whatever.

Summary of Results

The results obtained with ionization of the nose by a number of rhinologists were recently summarized by Alden[60]. This summary reported 700 bilateral ionizations for the treatment of seasonal or perennial allergic rhinitis and asthma. In a group of 416 cases of uncomplicated hay fever, complete relief was reported in 63 per cent; including those who obtained 80 to 95 per cent relief, 75 per cent of the cases were estimated as receiving 80 to 100 per cent results. Complete failures were reported in only 8 per cent.

In a group of 27 patients with asthma, complete relief was obtained in only 10, or 37 per cent. Varying degrees of partial relief was obtained in 5 patients and no relief was obtained in 12, or 44 per cent. In a group of 161 cases of hay fever and asthma, the number of patients receiving 80 to 100 per cent relief of hay fever was the same as that obtained in the pure hay fever group. The relief for the asthma in this group was much higher than in those patients who had asthma alone. Among 73 patients with allergic rhinitis, complete relief was reported in 34, or 46.5 per cent. Varying degrees of partial relief were obtained in 30 patients and no relief in 9, or 12.3 per cent. Among 28 patients with hay fever and also perennial symptoms, about the same complete relief was obtained for the hay fever as stated above. Eighty per cent of the patients with allergic rhinitis in this group received 80 to 100 per cent relief.

In a more recent report Alden states that desensitization is still the method of choice in the treatment of nasal allergy and advocates ionization to be reserved for those cases in which the obstructive and secondary symptoms are predominant and in which the mechanical relief to be expected is more than commensurate with the tissue damage incident to the treatment. He found that asthma was not lessened after ionization except in a few instances. He concludes that the failure of ionization rests solely upon its efficiency as an agent to reduce excessive intumescence and hypersecretion.

According to the observations of Hurd[61], in a large group of cases of hay fever, nasal allergy and asthma, 70 per cent of the patients with so-called hyperesthetic rhinitis were symptom-free after treatment. In the hay fever cases, symptoms disappeared immediately after ionization in almost all instances. After reviewing his observations on 150 cases, Hollender[62] found that while the results in seasonal hay fever were disappointing, this treatment was definitely satisfactory in cases of perennial vasomotor rhinitis. Bryant[63] reported his observations on a small group of cases of hay fever and hyperesthetic rhinitis. He obtained very satisfactory results.

Instead of employing ionization, a number of observers have resorted to the use of escharotics of various types, such as phenol, chromic acid and resorcinol. Lewy[64] states that the proportion of successes with resorcinol has been considerably greater than with any other treatment and with less reaction. Vistreich carried out intranasal application of phenol in 28 consecutive cases of early and late hay fever. The results were: 90 to 100 per cent relief in 75 per cent; 75 to 90 per cent relief in 8.3 per cent; 50 to 75 per cent relief in 12.5 per cent, and no relief in 4.2 per cent. Bernheimer made a study of the results of ionization in a group of 25 patients with hyperesthetic rhinitis and 10 with seasonal hay fever and compared them with a similar group treated with escharotics. He obtained somewhat better results with escharotics than with ionization, but found that the clinical course of hay fever was not altered by either method.

The possibility of complicating acute sinusitis by ionization should be taken into consideration. In our group of 20 cases, 2 developed an acute suppurative maxillary sinusitis as a result of the induced inflammatory reactions in the nose. In one patient the sinusitis subsided after irrigations of the maxillary sinus, but in the other patient the maxillary sinusitis persisted in spite of the irrigation treatment for about two months, at which time it was necessary to perform an intranasal operation.

In Bernheimer's group of cases, two patients with hyperesthetic rhinitis developed anosmia following ionization, which persisted for four and seven months, respectively. In another instance, a neuritis of the nasal ganglion persisted for 3½ months. No complications were noted following the use of escharotics.

Ionization should never be performed during the presence of an acute infection. In patients with nasal manifestations of allergy it is sometimes impossible to determine whether or not an acute exacerbation of symptoms is due to allergic reactions or is caused by an acute cold unless the cytology of the secretions is determined. The danger of a complicating acute sinusitis following an ionization procedure during the acute stage of rhinitis is a real one. It is a well-known fact that even the normal nose cannot be packed with gauze for a period of three or four days without causing retention and possible infection of the secretions of the sinuses. Marked obstruction of the nasal passages produced by the exudate in ionization certainly predisposes to infection, and this is one of the potential risks which must be taken when this treatment is employed.

Comment

There is considerable difference of opinion between the allergist and the rhinologist as to the relative effectiveness of ionization in the relief of the nasal manifestations of allergy. In the evaluation of the results obtained in the relief of hay fever by the injection of pollen extracts, it is generally agreed among allergists, that so far accurate statistics have not been compiled because of the lack of a uniform method of standardization by which results can be accurately estimated. For example, there is a great deal of difference of opinion as to what constitutes 80 to 90 per cent or complete relief of symptoms in hay fever cases. One individual's estimation of 90 per cent relief might coincide with another's estimation of 75 per cent relief. Because of the lack of any standard by which the results obtained in ionization may be evaluated, it is also very difficult to estimate accurately the results which may been reported. It appears, however, that there is a great deal of difference of opinion as to the results obtained from the standpoint of the allergist and from that of the rhinologist. Ionization, according to the allergist, is very unsatisfactory and far inferior to the allergic methods of management of the nasal manifestations of allergy.

In the selection of patients for treatment by allergic or ionization methods, it is naturally assumed that the diagnosis is definitely established. It has been our experience that in the diagnosis of the nasal manifestations of allergy the atypical as well as the typical cases must be selected for investigation. It is especially important that an accurate diagnosis be made in the atypical cases. Taking adults and children as a group, we have found that approximately 20 per cent of all patients studied although having some symptoms suggesting allergy, do not prove to have nasal allergy. If a patient is erroneously treated for the manifestations of allergy by allergic methods, complete failure will result. If on the other hand these patients are subjected to nasal ionization, assuming that they have the nasal manifestations of allergy, the results obtained will prove very satisfactory. If these

cases, therefore, are included in the statistical studies of the results of nasal ionization, it is evident that the percentage of cures of relief will naturally be much greater than if the non-allergic cases are definitely excluded.

Evidence has been presented which seems to indicate that the relief by ionization of the nasal mucosa is the result of a nonspecific local or general desensitization. Immunologic studies have shown that those cases satisfactorily responding to this treatment are characterized by a low degree of sensitivity with negative or borderline skin reactions and an absence of demonstrable reagins in the blood. These studies have also shown that in those patients with a high degree of sensitivity with definite positive skin reactions and reagins in the blood, the results of treatment, in general, are very unsatisfactory. It has also been demonstrated that no change occurs in the skin reactions as a result of ionization. Mucosal tests after ionization, however, have shown negative reactions in patients who are relieved, and positive reactions in those who were only partially or not at all relieved. Methods of local desensitization other than ionization have apparently failed to give satisfactory results in very hypersensitive individuals.

It appears that the local or general desensitizing effect of ionization is comparable to that resulting from the local treatment of the nose by physical or chemical agents which induce a local inflammatory reaction. The relief of other manifestations of allergy, such as urticaria, for example, by this method of treatment would suggest that there is also a general desensitization. That a general desensitizing effect may be produced by ionization of the skin instead of the nasal mucosa with relief of the nasal manifestations of allergy has been shown by Chajutin.

It is generally known that any of the manifestations of allergy may be relieved temporarily or for a prolonged period by procedure or disease which produces fever or a local inflammatory reaction. The artificial production of fever by the injection of vaccines, foreign proteins, or drugs, or the fever which may follow an acute infectious disease may effect a temporary relief of symptoms. It is also generally known that any operative procedure upon the nose, throat, or other parts of the body, a burn on the skin, a fracture or other severe trauma may likewise relieve symptoms for a variable period of time.

With nasal ionization the question finally arises as to the possibility of the production of permanent destructive changes in the nasal mucosa, the development of complicating suppurative sinusitis, loss of the sense of smell, and the appearance of asthma, especially in patients who previously have not had asthma. Although significant destructive changes in the human nasal mucosa apparently do not follow ionization, it has not as yet been determined whether repeated ionizations will not cause permanent undesirable effects. So far no tests have been made to determine whether any marked alteration in the physiology of the nose in relation to changes in the physical and bacteriostatic properties of the secretions as well as disturbances of filtration, humidification and temperature regulation of the inspired air may result from this procedure.

Summary and Conclusions

1. According to the observations of many leading rhinologists, ionization of the nasal mucosa is a safe and satisfactory measure in the treatment of hay fever and perennial nasal allergy.

2. According to the observations of several leading allergists, ionization does not give results comparable to those obtained by allergic methods of treatment.

3. A few rhinologists have reported results from escharotics equally as satisfactory as those obtained by ionization.

4. So far no permanent destructive changes produced by this procedure have been noted. Complications, such as anosmia, neuralgia, and sinusitis, however, have been reported in a few cases.

5. Satisfactory relief following ionization is apparently the result of a general desensitizing effect as well as shrinkage of the nasal tissues and the abolition of hypersecretion.

6. Accuracy in the diagnosis of all patients subjected to the various types of treatment discussed is essential in order to eliminate errors in the statistical comparison of results.

7. It is generally concluded that ionization in nasal allergy should be confined to those cases in which allergic methods of treatment have failed to give satisfactory relief of symptoms.

8. The selection of cases for this type of treatment, therefore, should be made by the close cooperation of the allergist and the rhinologist, or by the rhinologist adequately familiar with the practice of allergy.

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Further information regarding the walking mat may be obtained from the W. W. Stanley Co., 401 Broadway, New York, N. Y.
The heel brace is made by Mr. William Lilenfeld, 836 Flatbush Avenue, Brooklyn, N. Y.
Information concerning the Weiss heel may be obtained from the Orthovogue Shoe Co., 696 Fulton Street, Brooklyn, N. Y.

CLINICAL APPLICATIONS OF CHRONAXY

AMOUR F. LIBER, M.A., M.D.

NEW YORK

Classical electrophysiology had no means of determining the duration of passage of a stimulating current. With the apparatus available to the early investigators, the briefest current obtainable was 1/20 second. With condenser discharges, supplying currents as brief as 1/10,000 second, Hoorweg, in 1892, discovered a hyperbolic law relating the duration of current to threshold intensity. The shorter the passage of current, the greater the threshold intensity. Weiss (1901) employing a ballistic rheotome, confirmed Hoorweg's law, and expressed it conveniently in the equation $i=a/t+b$, where t is the duration of current in σ (1/1000 sec.), i the liminal intensity in volts, a a quantity of electricity corresponding to the vertical asymptote of the curve, b an intensity which is the galvanic threshold, now renamed the rheobase. Weiss stated that a/b is a quantity characteristic of excitability. L. and M. Lapicque pointed out that a/b is a time unit which they termed the *chronaxy*. They showed that it is the shortest time of passage of current which produces a response with an intensity twice the rheobase. They found, however, that the mathematical expressions did not exactly fit the data. None the less the chronaxy is an important quantitative characteristic of the excitability of nerves and muscles. The chronaxy is inversely proportional to the thickness of the nerve fiber, and the speed of muscle contraction. It is directly proportional to the refractory phase. A stimulus traverses approximately 1 cm. of nerve fiber in one chronaxy. The duration of the action current deflection is approximately 3 chronaxies. Curarization was found to be associated with an increase of the muscle chronaxy to more than double its value, while the nerve chronaxy remained normal. This led to Lapicque's law of isochronism: a muscle can be stimulated by its nerve only when the ratio between the chronaxies of the two organs is less than ½ (later modified to ⅓). Lapicque later found that isochronism only applied to systems where one nerve fiber corresponds to one muscle fiber, i.e. the skeletal musculature. Smooth muscles and the vegetative nerve fibers which innervate it constitute heterochronous systems, which can be stimulated by iterative stimuli and are subject to summation. When the number and frequency of stimuli are controlled, the duration-intensity relation is the same as for single stimuli and thus an iterative chronaxy can be found. When duration and frequency are constant and the number and intensity of stimuli are varied, a different characteristic quantity is found, called the time of summation, which represents the longest period during which excitations can be added with efficacy. Reflexes in the spinal frog are iterative. This is explained by heterochronism of the central neurone, whose excitability is represented by the summation time of the system. Destruction of supranuclear neurones resulted in changes in the chronaxies of peripheral nerves and muscles, a fact expressed by the law of subordination. Lapicque suggested that every action of the central nervous system influenced the chronaxies of all subordinate neurones and effectors.

These are the essential data on which the theory of chronaxy is based. Theoretic objections have been raised to several features of the theory, particularly to isochronism, by Lucas and Rushton, and are the subject of a controversy still raging. However, thus far none of the objections have invalidated the practical applications of chronaxy.

Clinical Application

The clinical application of chronaximetry to man was first effected by Bourguignon in 1911. The best known and most useful human chronaxies are those of skeletal muscles. Bourguignon[4] has shown that all the muscles can be classified according to chronaxy into 3 groups with values respectively .06 to .014σ, .16 to .34σ and .40 to .70σ. In each segment of the body, muscles of like chronaxy have like functions and are synergistic. Agonists and antagonists have chronaxies bearing the relation ½ to ⅓. When muscle degenerates following lesions of the motor nerve the chronaxy goes through 3 phases: (1) slight diminution, (2) increase, with different values obtained by stimulation of the nerve, of the motor point and bipolar stimulation of the muscle, (3) greater increase with the same thresholds to all 3 modes of stimulation. This last stage corresponds to the classic reaction of degeneration. These findings have received many applications in the diagnosis and prognosis of traumatic nerve section, of poliomyelitis (Péhu and Morin) and in the early detection of lead poisoning (Lewy). In tetany the facial muscles and the interossei of the hand have unstable chronaxies and often show neuromuscular heterochronism (Bourguignon and Turpin). Similar results were produced by voluntary hyperpnea (Bourguignon and Haldane). In myopathies Bourguignon[1] found muscle chronaxies similar to those of nerve degeneration. In peripheral vascular disease the chronaxy of the ischemic muscles increases progressively and can be used to determine the level of arterial obliteration (Moldaver). The chronaxies of the newborn vary from 1½ to 10 times the adult values and diminish gradually to the age of three. Bourguignon[7] further found that muscle chronaxy undergoes dynamic changes. In sleep it is 2 to 3 times the waking value. Pain and fatigue increase chronaxies. Voluntary contraction of extensor muscles in the upper extremity results in doubling the chronaxy of the flexors, while the extensor chronaxies do not vary with contraction of flexors. An example of pathologic dynamic chronaxy is myasthenia, where the muscle chronaxy is normal at rest but very rapidly doubles after 2 or 3 electric stimulations. Sensory disturbances produce slight changes in the muscle chronaxies. This occurs notably in tabes. All of these dynamic changes occur only in the muscle, the nerve chronaxies remaining unchanged. Altenburger found the chronaxy to increase rapidly, together with the rheobase, at the beginning of attacks of periodic paralysis, while it was normal in the interval. According to Bourguignon[7] dynamic chronaxy supplies an explanation of the mechanism of tonus and of reciprocal innervation.

Sensory chronaxy lacks the objectivity of muscle thresholds, since we depend on the patient's statement. Its clinical applications have been few. At different points of the skin, Bourguignon[5] found 3 kinds of sensation, contact, pain and heat, whose chronaxies were in the ratio of 1:5:10. Tactile sensation was isochronous with the adjacent muscles. Only contact and pain could be obtained by stimulating the nerve. In syringomyelia, the pain and heat chronaxies were greatly increased or unobtainable. In trigeminal neuralgia Lewy and Frazier found both the rheobase and the chronaxy increased and unstable, not only in the painful areas but in the whole ipsilateral side of the body. They concluded that trigeminal neuralgia is a complex syndrome with lowered thresholds in the peripheral nerve and a central disturbance of the thalamostriocortical system. The cutaneous reflexes are, according to Bourguignon,[4] responses of muscle isochronous to the tactile nerve endings of the stimulated skin region. He succeeded in producing these reflexes by single stimulation of the skin. The Babinski phenomenon is explained as follows. The normal chronaxy of the plantar sensory nerves

is .40 to .70σ and is the same as that of the flexors of the toes, while the extensors have a chronaxy of .16 to .34σ. In pyramidal tract lesions the chronaxies of the extensors and flexors are interverted. The extensors are now isochronous with the sensory nerve and consequently react alone to its stimulation. While electrical stimulation of tendon reflexes has not been accomplished, Bourguignon extended his theory to them.

Contradictory results of sensory stimulation were reported by other authors (Altenburger). Contact chronaxy was 0.2 and pain 0.33σ over the entire body. Isochronism with muscle groups was not confirmed. Certain sensations like tooth pain were found to be subject to iterative stimulation, giving .46 for the upper incisors and .26 for the lower. Altenburger pointed out that in certain tendon reflexes heterochronous muscles responded normally. Section of a single dorsal spinal root results in increased chronaxy of the dermatome, although no change can be clinically detected (Altenburger).

The chronaxy of the optic system (eye and optic nerve) was found by Bourguignon and Déjean to be double: 1.2 to 1.8σ for a peripheral phosphene, corresponding mainly to rods, and 2.1 to 3σ for a central phosphene corresponding to the cones in the fovea. Other authors have found the same range of values but have been unable to confirm the localization (Altenburger). Bourguignon and Déjean think it possible to stimulate the optic nerve head separately from the retina. They found the nerve chronaxy increased in retrobulbar neuritis, but unchanged in chorioretinitis and other retinal conditions. Other authors found the optic chronaxy increased in various types of ocular disease but normal in other cases even when vision was almost completely absent. They concluded that the optic chronaxy has no diagnostic significance (Altenburger). Zeldenrust found the normal chronaxy of the pupillary light reflex to be 32 to 51σ. It was increased in neurosyphilis and was sometimes the first evidence of change in pupillary action.

Gustatory chronaxy was found to be 1.5 to 1.8σ at the tip of the tongue and 0.4 to 0.5σ at the base. (A. and B. Chauchard). These authors suggested that when the chorda tympani was involved in otitis media the apical taste chronaxy would be increased.

The auditory chronaxy is normally 0.1σ. In disease of the middle ear it increases to 0.24 to 0.38σ. In nerve lesions it was 0.62 to 1.55σ (Gersuni, Volokhov and Andreef).

The chronaxy of the vestibular nerve is obtained by producing a reflex inclination of the head or the sensation of vertigo. Bourguignon found a different chronaxy and rheobase for head movements in the three planes of space, each corresponding to a different semicircular canal:

Movement	Semicircular Canal	Chronaxy, σ	Rheobase, volts
Rotation of head in horizontal plane....	Horizontal	3.1-5.6	3.4
Salutation	Vertical	6.0-10.4	2.4
Lateral inclination	Frontal	13.2-21.2	1.2

This is the only chronaxy which varies widely between individuals. According to Bourguignon, the more emotional subjects have the lowest vestibular chronaxy while the phlegmatic have the highest. There is familial resemblance between siblings. In mongolian idiots vestibular chronaxy was increased to 500-1500σ. In schizophrenics who were intermittently excited, it diminished during agitation and increased during apathy. Marinesco and Kreindler found that the vestibular reflexes are heterochronous systems. The iterative chronaxy was much shorter than that found by single stimulation.

It was 0.75 to 1.5σ. The vertigo chronaxy by single stimulation was 4-9σ. In 2 cases of acoustic neurinoma, ipsilateral reflex and vertiginous chronaxies were greatly increased but the summation time was normal. In 3 cases of multiple sclerosis with vestibular symptoms, the chronaxies were normal but the summation time was doubled. The conclusion was that the chronaxy changes in purely peripheral lesions while the summation time changes in lesions of the central vestibular apparatus.

The pyramidal tract can be directly stimulated in the intact human subject by bipolar electrodes placed respectively at the back of the neck and over the eye (Bourguignon[2]). Movements of various muscle groups result. The chronaxy of the pyramidal tract was thus found to be isochronous with that of the muscles stimulated. In unilateral traumatic lesions of the head, the chronaxy of the contralateral pyramidal tract was increased. Thus far the pyramidal chronaxy has received no further diagnostic application. But chronaxy of the skeletal muscles has proved useful in diagnosing disease of the central nervous system. In localized lesions of the spinal cord, chiefly tumors, Nagai measured the chronaxies of muscles corresponding to the various cord segments. He drew up a curve representing the percentile variation from the normal values and in all of 50 cases found a sharp deviation corresponding to the affected segments and the side of the lesion, when unilateral, as confirmed by operation. Similar data were obtained in the localization of lesions of the motor cortex. The perfection of these results permits one to question whether they would be reproduced in other series of cases. In Parkinsonism, Bourguignon[1] found the chronaxies of agonists and antagonists equalized.

The vegetative nervous system has a definite influence on chronaxy. Following sympathectomy, the pressure and pain chronaxy was diminished in the affected territory. Stimulation of the sympathetic ganglia increased the chronaxy (Foerster, Altenburger and Kroll). Muscle chronaxies underwent analogous but transient changes. Sympathomimetic and vagolytic drugs result in raised sensory and motor chronaxies while sympatholytic and vagomimetic drugs diminish the chronaxies.

In conclusion, chronaxy has served to quantify electrophysiology and to furnish an easily obtainable numerical expression of excitability. Its diagnostic possibilities are multiple, but have only begun to be utilized.

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ARCHIVES of PHYSICAL THERAPY
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.·. EDITORIALS .·.

PROGRAM OF THE SEVENTEENTH ANNUAL CLINICAL AND SCIENTIFIC SESSION

In this issue we publish the preliminary program of the Annual Congress Session to be held in Chicago, September 12 to 15th. A perusal of this program will at once impress the reader with its magnitude. The diversity of subjects to be discussed, the wide range of the specialties covered and the general scope of the exhibits speak for an interesting and valuable convention session which should attract every physician and technician engaged in physical therapy.

The added feature of this year's meeting is the reinforcement by the American Occupational Therapy Association. This Association is closely allied with the Congress in its ideals and the combined forces should prove of powerful influence in more ways than one. We greet the Occupational Therapy Association and welcome them. We sincerely hope that the joint gathering will bring out a full attendance.

From the members of the Congress we anticipate cooperation not only in your own attendance but in that of your colleagues. This is your convention. Everything possible has been done to make it outstanding. Come to Chicago in September. Enjoy the comforts of a fine summer resort and at the same time profit by the splendid program which has been prepared for you.

If you contemplate registering for the instruction seminar which precedes the convention, please do so at once. Do not defer this important matter to the last minute. Also, we urge, for your own convenience and comfort, make your hotel reservations early.

Let us make this the biggest meeting in the history of the Congress. You will agree when you attend that your time was well spent. We hope to greet you in Chicago in September.

FEVER THERAPY—NEED FOR RATIONALIZATION OF INDICATION

No one will dispute the contribution which fever therapy by diathermy has made to medicine. The researches in this field stand out prominently among the more recent advances in a large number of diseases. It is unfortunate that there is still some misunderstanding concerning the means by which fever therapy can be produced. Likewise it is unfortunate that the procedure is being exploited by inexperienced clinicians, and in some instances, by cultists, without due consideration for the rationale of indication and the ability of the subject to safely withstand the treatment.

Fever therapy has been tried in practically every intractable condition on an empiric basis. In some it has produced dramatic results, while in others it has been a failure. The time has come when due appraisal must be made. We can no longer continue its use in certain conditions which lend themselves poorly to the effects of hyperpyrexia. We should discontinue its application in diseases which by experience we now know yield more effectively

to other means. If fever treatment is to retain a scientific status, the rationale of indication must be more soundly established.

The literature is replete with reports of hundreds of investigators. Conferences are held periodically and personal experiences expounded. Testimonials of patients often make the listener question its whereabouts. Enthusiasm still reigns, but in it all there is an absence of deep scientific approach. This is not a reflection on the conscientious investigator, nor a jolt to the worker who has sincerely carried on. It is rather intended as a warning to those who have endeavored to imitate and duplicate without regard for potentialities and without a comprehension of the fundamentals involved.

Let us direct our efforts to rationalization of indication. Let us place fever therapy in a position where its utilization will withstand every form of criticism and argument. Fever therapy merits such consideration.

CHRONAXY

The development of electrophysiology is an instructive chapter of the history of science. It demonstrates the close interdependence of theory and technic and the value of collaboration between different sciences. In the first formulations of electrophysiology by Du Bois-Reymond in Germany (1845), only two factors of excitability were measured: the amplitude and the suddenness of the electric change necessary for stimulation. In spite of enormous efforts no satisfactory quantitative expression of excitability was evolved. In 1889, the French physiologists Chauveau and Arloing borrowed from physics the use of condenser discharges, giving extremely brief electric currents. With this method, in 1892, the Dutch physicist Hoorweg discovered that the duration of the stimulating current is a factor of the threshold of excitation and found a mathematical expression of this relation. The scene now shifts back to France, with the work of George Weiss, who, in 1903, brilliantly confirmed Hoorweg's discovery and derived an expression for a quantity which characterizes excitability. L. and M. Lapicque termed this quantity the chronaxy and showed that it is the shortest duration of current which produces a response when the intensity of the current is twice the galvanic threshold. The Lapicques now discovered the principal data of excitability. Each species of animal, each kind of muscle has its characteristic chronaxy. The chronaxy of a nerve bears definite relations to the size of the nerve fibers, the speed of conduction and the duration of the action current. A striated muscle can be excited by its nerve only if the chronaxies of the two organs are in a ratio of less than 3:1. Curare and other poisons produce inexcitability by increasing this ratio. Stimulation or destruction of supranuclear neurones change the chronaxies of all neurones subordinate to them — a generalization which gives us a glimpse into the intimate mechanism of the central nervous system.

Beginning in 1911, Georges Bourguignon, at once a medical electrologist (in France this is a distinct specialty) and neurologist, has applied chronaximetry to man and to the diagnosis of disease of the nervous system. He has utilized the material of the great center of neurology at the Salpetrière hospital in Paris, first in collaboration with Pierre Marie and later with Georges Guillain. At first limited to nerves and muscles, clinical chronaximetry has now been extended to the sense organs and to the central nervous system.

From the combined contributions of the physiologist, the physicist, the electrodiagnostician and the neurologist, chronaximetry has developed into

one of the most promising instruments of physiologic research and of clinical diagnosis. Physical therapists and neurologists who will familiarize themselves with its technic and apply it both for the diagnosis and control of the progress of lesions affecting the neuro-muscular systems will find a rich field for practical work. It is by the advances characterized by physiologic precision that clinical medicine is gradually gaining in its scientific aspect and thereby improving also as a humanitarian art.

NASAL IONIZATION: NEWER CONSIDERATIONS

Like so many other procedures in medicine nasal ionization has passed through several periods varying from enthusiasm to ultraconservatism. Only a few years ago the method was heralded by some workers as a cure-all for nasal allergy; now the pendulum has swung the other way and rhinologists are adopting a saner attitude.

There are those who are utterly opposed to the procedure without justification for such a stand save that electricity is entailed in the technic. The more progressive have followed the method with interest, keen observation, conservatism and scientific regard. The method is definitely not a cure-all. Nor is it indicated for indiscriminate application. The unfortunate situation of employing ionization for improperly selected cases has placed it in disrepute with some rhinologists.

As the problem now stands, the main issue is that of ultimate and permanent effects on the nasal tissues. This subject is presented in an interesting report by Hollender and Fabricant,[1] who attempt to prove that fallacious deductions have resulted from the limitations of nasal tissue examinations. They write: "There has been manifested in some quarters a tendency to reject ionization because histologic studies have allegedly demonstrated deleterious changes in the tissue which were assumed to be permanent or to require considerable time for resolution."

After reviewing the histopathologic studies of other workers, Hollender and Fabricant contend that a critique of the methods heretofore employed must of necessity encompass three cardinal points: (1) the determination, if at all feasible, of the constancy of normal nasal epithelium in the human nose; (2) the method of interpreting the results of biopsy obtained in conventional practice, and (3) the fallacy of making deductions and conclusions without more accurate data. The histologic changes which occur in cases of allergy are characterized by (1) edema, which involves all the mucosal layers, and (2) an eosinophilic infiltration of the tissues, which, together with the edema, produces alterations in the glands, the blood vessels and the stroma of the fibrous tissue.

An interesting point is made from the work of Hansel[2] and other investigators who have brought to our attention that in cases in which chronic infection is superimposed on an allergic process, certain characteristic changes are produced which represent histologic pictures of both allergic and chronic inflammation of the infectious type. "The two changes may vary in individual cases and even in parts of the same biopsy specimen. Thus, the allergic picture predominates in one case and the infectious in another, or there are equal or unequal representations of both. Hence, in one area the epithelium may be normal, while in other areas it apears to be hyperplastic. The basement membrane is absent in one area, slightly thickened in another, and markedly thickened in a third. In the subepithelial layer, edema, eosinophilic infiltration and fibrosis vary in extent and concentration. The glands consequently are dilated or cystic, atrophied, compressed or fibrotic."

The main question proposed at this time is: "Does an allergic or a chronically infected nose afford a suitable 'normal control' for the microscopic study of ionization?" Dean[3] and his associates hold that ionization of nasal tissue produces within this tissue definite pathologic changes. By their studies, Hollender and Fabricant have shown that this process is characteristic in chronic inflammation and in nasal allergy. "It is therefore rational to believe that many of the changes seen microscopically after ionization are identical with those that existed before ionization."

The present method of histologic study of the nasal mucosa is questioned. How can it be definitely asserted that the state of the nasal mucosa prior to ionization was normal? Furthermore, has normal nasal mucosa been accurately defined? It is undoubtedly true that biopsy is too restricted to yield sufficient or adequate information about the entire nasal mucosa. The results of studies on animal nasal tissues are not applicable to human beings because in the latter it is not feasible to remove complete specimens from the nose as is done, for instance, in dogs.

The present investigation does not concern itself with the merits or demerits of ionization. It leaves this decision to the rhinologist. Whether tissue injury results from the procedure has been controversial. If the deductions of Hollender and Fabricant are correct, and their evidence points to this, then the claim that mucosal harm is produced cannot be adequately supported. While their study purports to evaluate biopsy only insofar as nasal ionization is concerned, the observations are of far greater significance. If biopsy is inadequate to gauge the possible tissue changes of ionization, it likewise is inadequate to demonstrate the alterations produced by other procedures. Much of our present concepts concerning nasal histopathology may require revision. The problem is, however, of extreme importance and further work will be necessary to support or refute the results presented.

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Correspondence

The following comment on the editorial entitled "Physical Therapy in the Next War" in the last issue has been received from the Surgeon General of the U. S. Army.

I agree thoroughly with your editorial on "Physical Therapy in the Next War." There has been a remarkable development in this phase of medical and surgical treatment in the Army hospitals since the World War. In fact, we always plan a large physiotherapy section in our new hospitalization. We are also employing physiotherapy aides; so that at the present time we consider them a part of our service.

We are prepared to substantiate the statement that physiotherapy has aided particularly the orthopedic surgeons in returning to duty in a far shorter time cases of injuries to points and strained muscles. All of this, of course, is intimately associated with electrotherapeutics, the use of light and heat.

You will also recall that the recent annual reports of the Surgeon General stress the increased number of cases on sick report from injuries as compared with disease. When I came to Washington I immediately placed the subject of orthopedic surgery and physiotherapy as one of the leading courses at the Army Medical School for recent appointees. In fact, this subject ranks next to preventive medicine in that course today.

CHARLES R. REYNOLDS,
Major General, U. S. Army,
The Surgeon General.

THE STUDENT'S LIBRARY

HEART DISEASE IN GENERAL PRACTICE. By *Paul D. White*, A.B. M.D., Assistant Professor of Medicine, Harvard University Medical School. In National Medical Monographs, Series of 1937, Edited by *Morris Fishbein*, M.D. Cloth. Pp. 338 with 47 illustrations. Price, $3.00. New York: National Medical Book Company, 1938.

This is a brief and practical summary of the present knowledge of the diagnosis, prognosis and treatment of heart disease. It is a book for the general practitioner. Much of the material is presented in the form of questions and answers which the author has found to be of great value for instruction in graduate courses on this subject. The details of methods and pathology, the controversial questions, the exceptional types, and references to the literature are wisely left to larger works on the subject. For the purpose intended this small monograph is a lucid and informative review of cardiac diseases, such as most often come under the scrutiny of general practitioners.

THE EVOLUTION OF CHRONIC RHEUMATISM WITH TREATMENT TO CORRESPOND. The Preventive Clinic as a First Line of Defense. By *R. Fortescue Fox*, M.D., F.R.C.P. Founded on a lecture delivered at Margate, at the Congress of The Royal Institute of Public Health and The Institute of Hygiene, May, 1937. Paper. Price, 2s. 6d. Pp. 26, with 5 illustrations. London: H. K. Lewis & Co., Ltd., 1938.

This small brochure on the origin and treatment of chronic rheumatism is of interest to every physician using physical therapy in this disease. The distinguished author gives first place among remedies to heat because it is a *sine qua non* of life, every least variation in external heat producing its proper physiologic reaction in the organism. Fox states: "I would also commend its precise use very earnestly to my colleagues, because, unfortunately, with all our knowledge, the reactions to external heat in the rheumatic subject in the various phases of his disease are very little understood and are greatly in need of investigation." This *leitmotif* of the work conveys a good idea of the purpose for which it was prepared. It merits careful perusal.

MIDDLE AGE IS WHAT YOU MAKE IT. By *Boris Sokoloff*, M.D., Sc.D. Cloth. Price $1.75. Pp. 201. New York: The Greystone Press, 1938.

Knowledge and experience should make the middle age a period of the greatest capacity for achievement and of physical and spiritual maturity. Often a person of middle age is hampered by small defects in his physical mechanism, and these trifles may become true obstacles to his efficiency and activity. It is only when these ailments become chronic that he consults a physician. Often this is too late, for chronic diseases can be treated but cannot always be cured. The author believes that preventive medicine has not been adapted to the needs of the middle aged. This age is somehow a stepchild of medical science. Children's diseases and child mortality have greatly decreased in recent years because of preventive medicine, but chronic diseases common to individuals of mature age are more prevalent than ever. The aim of this book is to emphasize the importance of this phase of preventive medicine. It should be read by every physician.

FRACTURES AND DISLOCATIONS. By *Philip Lewin*, B.S., M.D., Associate Professor of Orthopaedic Surgery, Northwestern University Medical School, Attending Orthopaedic Surgeon, Cook County Hospital, Attending Orthopaedic Surgeon, Michael Reese Hospital, Chicago. Volumes I and II. National Medical Monographs. Edited by *Morris Fishbein*, M.D. Cloth. Price, $6.00, per set. Pp. 318; 319-698, with 82 illustrations. New York: National Medical Book Co., Inc., 1937.

The frequency with which general practitioners as well as surgeons are called upon to care for fractures and other injuries resulting from machines as well as vehicles justifies the publication of special books on fractures and dislocations. The two-volume work of Lewin while primarily written to meet the needs of general practitioners lacks nothing in the usual methods of presentation and contains many data and suggestions not found in many other similar works. Of especial interest is a section of the first volume devoted to hospital organization for the management of fractures. The remainder of the first volume deals with fractures of the vertebrae, ribs, scapula and clavicle. The second volume is devoted to fractures of the extremities and discusses dislocations at some detail. Operative therapy of fractures is presented rather briefly and in keeping with the purpose of the book. The author stresses the non-operative management of nearly all fractures and gives the required directions lucidly in accordance with the latest advances in this particular field. A feature of this book meriting special mention is the author's emphasis of the necessity of cooperation between laymen and the medical profession in the matter of immediate first aid at the scene of an accident and the proper removal of patients to the hospital. Physical therapy, too, is discussed from a broad viewpoint, the proper time and place of its application being stressed as conditions for effective results. The two volumes are highly recommended as useful guides to the management of the frequent and serious injuries encountered in modern life.

PLAY AND MENTAL HEALTH. Principles and Methods for Teachers. By *John Eisele Davis*, Veterans Administration Facility, Perry Point, Md. Cloth. Price $2.50. Pp. 202. New York: A. S. Barnes & Co., 1938.

This book presents for the organization of effective mental hygienic practices in schools and develops a psychology of play in line with the spirit and the recent advances of psychiatric practices in child education. The use of play is discussed as: a psychic adjustment, as in playing with others rather than against others; play as a means of compensation for inadequacy of other things; play for mentally well and mentally ill to assist the individual in exercising his natural social ability in acceptable activity. Play in early life may have a definite effect on behavior traits, and may be used to elevate a child from the play level to the work level by making chores pleasant and at the same time giving the child responsibilities. Types of play should be arranged to fit the physical and personality needs of various groups. The child should be trained in his play experiences to find the most basic and fundamental values and relate them to one another so that spiritual understanding may be gained and the development of strong character may be furthered. The value of play is also considered as contributing to natural self-adjusting hygienic processes, as well as providing for meeting life situations and affords a more diversified and understanding approach. A sympathetic understanding and participation by the parent is needed so the child may associate the proper emotions and other desirable psychic values with their phantasy preoccupations. Talking with the child when playing is important in expanding the vocabulary as well as knowledge, interest and activity of the child. Education has no more serious responsibility than making adequate provision for enjoyment of recreative leisure, not only for the fact of immediate health but still more for its lasting effect upon habits of the mind. The value of education of play is its power to interest the player, absorb his attention, and arouse him to enthusiastic and persistent activity. This book is highly recommended to teachers, parents and psychiatrists.

THE FOOT. By *Norman C. Lake*, M.D., M.S., D.Sc. (Lond.) F.R.C.S. (Eng.) Senior Surgeon and Lecturer on Surgery, Charing Cross Hospital, Director of Studies, London Foot Hospital, Late Senior Examiner in Surgery, University of London and External Examiner in Surgery, Victoria University, Manchester. 2nd Edition. Cloth. Price $4.50. Pp. 366 with 113 illustrations. Baltimore: William Wood & Company, 1938.

This is the second edition of this excellent book, the first having appeared in 1935. The author believes that in no other region of the body is an understanding of the evolutionary history, as a preliminary to the study of anatomy and physiology, more essential than in the foot, of which adequate descriptions are presented. The chapter on footwear contains some interesting facts on the development of footwear from papyrus sandals to our present day shoes. Diseases of the feet cause much industrial and social incapacity. Many of these are minor ones that can easily be corrected. The book considers abnormalities, injuries and infections; flat foot; hallux valgus, rigidus, and flexus; hammer toe; warts and corns; affections of the nails; pes cavus; metatarsalgia and painful heels; bursitis, swelling of the foot and ankle; chilblains; vasospastic lesions; ulcers; new growths; osteochondritis and apophysitis; congenital club foot; and miscellaneous conditions. Some of the suggested methods of treatments will be questioned by those interested in physical therapy. For instance in 30 pages devoted to flat foot only half a page discusses exercise. This book contains much that is helpful to general practitioners.

ADOLESCENCE. By *Maurice A. Bigelow*, Ph.D., Sc.D., Professor of Biology and Director of Practical Science Research, Teachers College, Columbia University. Cloth. Price 35c. Pp. 99. New York: Funk & Wagnalls Company, 1937.

LOVE AND MARRIAGE. By *Thomas Walton Galloway*, Ph.D., Litt.D., Late Professor of Zoology, Beloit College and Associate Director of Educational Measures, American Social Hygiene Association. Cloth. Price 35c. Pp. 102. New York: Funk & Wagnalls Co., 1937.

Much of the literature on these two subjects treats the problems presented in the monographs with colorful exaggeration, and some of it is little better than a hodge-podge of pseudoscience and half truths. It is important to recognize the profound influence of sex on society, that it is the germ out of which family and social bonds have developed. The only way in which the result of experience regarding adolescence, love, marriage and sex relations can be made of service to the young is by education. These two books consider these subjects in a popular sincere and scientific manner and can be highly recommended.

LIFE, HEAT AND ALTITUDE. By *David Bruce Dill*, Fatigue Laboratory, Harvard University. Cloth. Price $2.50. Pp. 211. Cambridge: Harvard University Press, 1938.

This book considers the physiologic effects of hot climates and great heights on living organisms, whose responses show certain uniformities even among different species, and on the other hand, instructive differences within the same species. Those interested in physical therapy are compelled to give attention to the physiologic effects of the environmen on man. The chapters on energy exchange and environment, perspiration and thirst are of special interest as they concern many of the physiologic responses seen in fever therapy. The chapters on animal life in great heights, man in high altitudes, and high altitude flying should be of interest to mountain climbers and aviators. The book will be read with interest by laymen and physicians.

CLINICAL ROENTGEN THERAPY. Edited by *Ernest A. Pohle*, M.D., Ph.D., F.A.C.R., Professor of Radiology; Chairman, Department of Radiology and Physical Therapy in the University of Wisconsin, Madison, Wisconsin. Foreword by *George W. Holmes*, M.D., Roentgenologist to the Massachusetts General Hospital and Clinical Professor of Roentgenology in Harvard Medical School, Boston, Massachusetts. 819 pages, 199 engravings, and one colored plate. Price $10.00. Lea & Febiger, Philadelphia, 1938.

The editor and 16 other eminent authorities have collaborated in a serious attempt to prepare a comprehensive textbook on roentgen therapy. This subject has been covered in a concise, succinct style according to various bodily groupings, including the blood and blood-forming organs. The authors have produced the first real text-book on roentgen therapy in the English language, each of the seventeen authorities having contributed separate chapters dealing with their particular fields. The book covers in an authoritative manner the accumulated knowledge in this field and presents the latest technic in detail. Only the practical phases have been covered, as the theoretical principles of roentgen therapy have previously been presented in a companion volume by the editor. As it is difficult to separate radiation therapy into roentgen and radium aspects, sufficient data have been given regarding the latter in the text to convey a composite picture of the proper irradiation therapy. A valuable chapter on medico-legal aspects and an excellent index are included. This book is probably one of the most important practical contributions that has yet been published on the subject of radio therapy.

HEALTH AND MUSCULAR HABITS. By Lieut. Colonel *J. K. McConnel*, D.S.O., M.C., Member of the Chartered Society of Massage and Medical Gymnastics, and *F. W. W. Griffin*, M.A., M.D., etc., Editor, Journal of the Chartered Society of Massage and Medical Gymnastics, Medical Adviser to the Incorporated Lucas-Tooth Boys Training Fund (Lucas-Tooth Gymnasium), Foreword by Rt. Hon. *Lord Horder*, K.C.V.O., M.D., F.R.C.P. Cloth. Price 5s. Pp. 159 with 27 illustrations. London: J. & A. Churchill, Ltd., 1937.

The main purpose of this book, according to the foreword, is to draw attention to the need for corrective methods rather than the mere insistence upon so called "muscular development." The authors believe that muscular habits, both good and bad, are the result as well as the cause of a psychologic outlook on life. It is emphasized that exercises alone are not enough and that it is important to acquire healthy muscular habits during the whole twenty-four hours. The authors stress the value of good habits of posture in the trunk and pelvis, which they believe are determined largely by activities in the fore-part of the body. Muscular habits of the foot are dealt with at length because good foot habits improve balance, which is the foundation of so many activities in life. This book is written in non-technical language and will appeal to anyone interested in health and good muscular habits.

VENEREAL DISEASES, Their Medical, Nursing and Community Aspects. By *William Freeman Snow*, M.D., General Director, American Social Hygiene Association. Pp. 98.

HEAR BETTER. By *Hugh Grant Rowell*, M.D., Associate General Adviser, Department of Education of the Handicapped, and Physician to the Horace Mann School, Teachers College, Columbia University, New York City. Pp. 83.

WHY THE TEETH. By *Leroy M. S. Miner*, D.M.D., M.D., Sc.D., Dean of the Dental School and Professor of Clinical Oral Surgery, Harvard University. Pp 71.

TUBERCULOSIS. By *H. E. Kleinschmidt*, M.D., Director of Health Education Service, National Tuberculosis Association. Pp. 77.

THE HUMAN BODY. By *Thurman B. Rice*, A.M., M.D., Professor of Bacteriology and Public Health, Indiana University School of Medicine, Indianapolis, Indiana. Pp. 88.

YOUR MIND AND YOU. By *George K. Pratt*, M.D., Medical Director, Connecticut Society for Mental Hygiene. Pp. 126.

Six Volumes of National Health Series, Edited by the National Health Council. Cloth. Price, per copy, 35 cents. New York: Funk & Wagnalls Company, 1937.

The National Health Council has aimed to provide a series of twenty short books that would give to lay readers helpful and authoritative information about various aspects of personal and community health with which they should be familiar. These six volumes are part of this series. They can be highly recommended to physicians for their abbreviated review of important topics in medicine, or to their patients in order to acquaint them in an informal fashion of the latest advances and opinions on the body, mind, structures and diseases of man.

Clinical Applications of Chronaxy — Liber

(*Continued from page 502*)

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14. Pehu, M., and Morin, G.: J. de Méd. de Lyon **14**:137, 1933.
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PRELIMINARY PROGRAM

INSTRUCTION SEMINAR — PHYSICAL THERAPY
17th ANNUAL SCIENTIFIC SESSION
American Congress of Physical Therapy
and 22nd ANNUAL MEETING
American Occupational Therapy Association

INSTRUCTION SEMINAR Sept. 7, 8, 9, 10, 1938
ANNUAL SESSIONS Sept. 12, 13, 14, 15, 1938

PALMER HOUSE CHICAGO

SCHEDULE OF DAILY ACTIVITIES

17th Annual Session
American Congress of Physical Therapy

SUNDAY, September 11

12 Noon. Luncheon—Executive Session—Board of Registry and Members of Advisory Board of Registry—Room 9, 3rd floor.

6:30 P.M. Dinner—Executive Session—Board of Governors and Executive Council—Room 9, 3rd floor.

MONDAY, September 12

8 A.M. Registration.

9 A.M. EXAMINATION OF TECHNICIANS by American Registry of Physical Therapy Technicians—Room 8, 3rd floor.

10 A.M. GENERAL SCIENTIFIC SESSION—Grand Ball Room.

12 to 2 P.M. Luncheon and Inspection of Exhibits.

2 to 5 P.M. BUSINESS SESSION—Room 17, Club floor.

5 to 6 P.M. Inspection of Exhibits.

6 to 8 P.M. Dinner.

8 P.M. FORMAL OPENING SESSION—Grand Ball Room.

TUESDAY, September 13

8 A.M. Registration.

9 to 12 Noon. Seminars in Sections:

(a) SECTION ON MEDICINE—Room 14, Club floor.
(b) SECTION ON SURGERY—Room 18, Club floor.
(c) SECTION ON UROLOGY—Room 15, Club floor.
(d) SECTION ON EENT—Room 17, Club floor.
(e) SECTION ON GASTROINTESTINAL DISEASES—Room 9, 3rd floor.

12 to 2 P.M. Luncheon and Inspection of Exhibits.

2 to 5 P.M. SECTION ON EENT—Room 17, Club floor.

2 to 5 P.M. GENERAL SCIENTIFIC SESSION—Grand Ball Room.

6:30 P.M. ANNUAL CONGRESS DINNER JOINTLY WITH AMERICAN OCCUPATIONAL THERAPY ASSOCIATION—Red Lacquer Room.

WEDNESDAY, September 14

8 A.M. Registration.

9 to 12 Noon. JOINT MEETING, American Congress of Physical Therapy and American Occupational Therapy Association—Grand Ball Room.

12 to 2 P.M. Luncheon and Inspection of Exhibits.

2 to 4:30 P.M. JOINT MEETING, Continued—Grand Ball Room.

6 to 8 P.M. Dinner.

8 P.M. GENERAL SCIENTIFIC SESSION—Grand Ball Room.

THURSDAY, September 15

8 A.M. Registration.

9 to 12 Noon. Seminars in Sections:

(a) SECTION ON FEVER THERAPY—Grand Ball Room.
(b) SECTION ON SURGERY—Room 18, Club floor.
(c) SECTION ON EENT—Room 17, Club floor.
(d) SECTION ON MISC. SUBJECTS—Room 14, Club floor.

12 to 2 P.M. Luncheon and Inspection of Exhibits.

2 to 5 P.M. GENERAL SCIENTIFIC SESSION—Grand Ball Room.

JOINT BANQUET

American Congress of Physical Therapy
and
American Occupational Therapy Association

TUESDAY, September 13, 6:30 P.M.

RED LACQUER ROOM

For the American Congress of Physical Therapy

Toastmaster: FRANK H. KRUSEN, M.D., President.

Guest Speakers: MORRIS FISHBEIN, M.D., Editor, Journal American Medical Association.

ROBERT HAYES, M.D., President, Chicago Medical Society; JAMES H. HUTTON, M.D., President-Elect, Illinois State Medical Society.

Gold Key Awards: ROY W. FOUTS, M.D., Chairman, Awards Committee.

Scientific Exhibit Awards: WILLIAM BIERMAN, M.D., Chairman, Scientific Exhibit Committee.

For the American Occupational Therapy Association

Address: JOSEPH C. DOANE, M.D., President, American Occupational Therapy Association.

Speaker: IRVING S. CUTTER, M.D., Dean, Northwestern University Medical School, Chicago.

Banquet Committee

A. C. P. T.	A. O. T. Association
MADGE C. L. MCGUINNESS, M.D., Chairman.	MRS. VALENTINE LEWIS, Chairman.
JOHN SEVERY HIBBEN, M.D.	DOROTHY RICHARDSON, O.T.Reg., Co-Chairman.
JOHN D. CURRENCE, M.D.	LILLIAN L. SPENCER, O.T.Reg.
FREDERICK L. WAHRER, M.D.	FAY E. CAMPBELL, O.T.Reg.

LECTURERS AND CLINICIANS FOR INSTRUCTION SEMINAR

●

ALBERT BACHEM, Ph.D., Professor Biophysics, University of Illinois College of Medicine, Chicago;

WILLIAM BIERMAN, M.D., Assistant Clinical Professor Therapeutics, New York University College of Medicine, New York;

HOWARD A. CARTER, B.S. in M.E., Secretary, Council on Physical Therapy, American Medical Association, Chicago;

FREMONT A. CHANDLER, M.D., Assistant Professor Orthopedic Surgery, Northwestern University Medical School, Chicago;

MAURICE H. COTTLE, M.D., Otolaryngologist, Children's Memorial and Illinois Masonic Hospitals, Chicago;

JOHN S. COULTER, M.D., Associate Professor Physical Therapy, Northwestern University Medical School; Member Council on Physical Therapy, American Medical Association, Chicago;

JOHN D. CURRENCE, M.D., Assistant Professor Clinical Medicine, New York Post-Graduate Medical School, Columbia University, New York;

GEZA DE TAKATS, M.D., Associate Professor Surgery, University of Illinois College of Medicine, Chicago;

FRANK H. EWERHARDT, M.D., Professor Physical Education; Assistant Professor Physical Therapy, Washington University School of Medicine, St. Louis, Mo.;

KRISTIAN G. HANSSON, M.D., Instructor Clinical Surgery (Orthopedics), Cornell University School of Medicine, New York;

KARL HARPUDER, M.D., Assistant Clinical Professor of Medicine, Columbia University College of Physicians and Surgeons, New York;

I. F. HUMMON, Jr., M.D., Assistant Roentgenology, Loyola University School of Medicine; Attending Physical Therapist, Cook County Hospital, Chicago;

MILAND E. KNAPP, M.D., Assistant Surgery, University of Minnesota School of Medicine; Director Physical Therapy, Minneapolis General Hospital, Minneapolis;

DISRAELI KOBAK, M.D., Assistant Clinical Professor Medicine (Physical Therapy) Rush Medical College of University of Chicago; Chicago;

RICHARD KOVACS, M.D., Clinical Professor Physical Therapy, New York Polyclinic Medical School and Hospital, New York;

FRANK H. KRUSEN, M.D., Chief of Section on Physical Therapy, Mayo Clinic; Member Council on Physical Therapy, American Medical Association, Rochester, Minn.;

DAVID E. MARKSON, M.D., Assistant Professor Medicine, Northwestern University Medical School, Chicago;

GILBERT MARQUARDT, M.D., Associate Medicine, Northwestern University Medical School, Chicago;

MADGE C. L. McGUINNESS, M.D., Director Physical Therapy, Lenox Hill and Misericordia Hospitals, New York;

HARRY E. MOCK, M.D., Associate Professor Surgery, Northwestern University Medical School; Chairman, Council on Physical Therapy, American Medical Association, Chicago;

FRED B. MOOR, M.D., Professor Pharmacology and Therapeutics, College of Medical Evangelists, Los Angeles;

OSCAR B. NUGENT, M.D., Professor Ophthalmology, Chicago Eye, Ear, Nose and Throat College, Chicago;

KENNETH PHILLIPS, M.D., Director Physical Therapy Center; Chief Medical Service, James M. Jackson Memorial Hospital, Miami, Fla.;

NATHAN H. POLMER, M.D., Assistant Professor Clinical Medicine, Tulane University of La., School of Medicine, New Orleans;

C. I. REED, Ph.D., Associate Professor Physiology, University of Illinois College of Medicine, Chicago;

WILLIAM H. SCHMIDT, M.D., Associate Professor Physical Therapy, Jefferson Medical College, Philadelphia;

MILTON G. SCHMITT, M.D., Clinical Assistant Physical Therapy, Northwestern University Medical School; Director Physical Therapy, Garfield Park Community Hospital, Chicago;

MARJORIE TAYLOR, O.T. Reg., Director Department of Occupational Therapy, Milwaukee-Downer College, Milwaukee;

NORMAN E. TITUS, M.D., New York;

WALTER J. ZEITER, M.D., Director Physical Therapy, Cleveland Clinic, Cleveland.

SCHEDULE OF LECTURES AND CLINICS

Instruction Seminar

SEPTEMBER 7, 8, 9, 10, 1938 —

(Just preceding the 17th Annual Convention — September 12, 13, 14, 15, 1938.)

Palmer House, Chicago

WEDNESDAY, September 7

9 to 10 A.M. Organization Period.
10 to 11 A.M. Low Voltage Currents, Physical Aspects Apparatus — CARTER.
11 to 12 A.M. Introductory Aspects of Radiation — BACHEM.
Luncheon Period, Round Table Discussion.
2 to 3 P.M. Physical Therapy in Ophthalmology — NUGENT.
3 to 4 P.M. Physical Therapy in Otolaryngology — COTTLE.
4 to 5 P.M. Physiology in Relation to Physical Therapy — REED.
Dinner 5 to 7 P.M.
7 to 8 P.M. Physical Therapy in Fractures — COULTER.
8 to 9 P.M. Peripheral Vascular Disease — DE TAKATS.

CLINICS

THURSDAY, September 8

9 to 11 A.M. Short Wave Diathermy — Cook County Hospital — KOBAK.
10 to 12 A.M. Low Back Pain — Northwestern University — CHANDLER.
10 to12 A.M. Arthritis — Northwestern University — MARKSON and COULTER.
10 to 12 A.M. Traumatic Surgery — Illinois Central Hospital — COULTER.
10 to 12 A.M. Vascular Diseases — Wesley Memorial Hospital — MARQUARDT.
2 to 4 P.M. Manipulation in Low Back Cases — Cook County Hospital — HUMMON, JR.
2 to 4 P.M. Fever Therapy — Garfield Park Community Hospital — SCHMITT.
2 to 4 P.M. Peripheral Vascular Diseases — Illinois Research Hospital — DE TAKATS.
2 to 4 P.M. Back Injuries — St. Luke's Hospital — MOCK.
Dinner 5 to 7 P.M.
7 to 8 P.M. Arthritis — KRUSEN.
8 to 9 P.M. Fever Therapy — Technical Aspects — PHILLIPS.

FRIDAY, September 9

9 to 10 A.M. Electrodiagnosis — POLMER.
10 to 11 A.M. Short Wave Diathermy — KOBAK.
11 to 12 A.M. Occupational Therapy — TAYLOR.
Luncheon Period, Round Table Discussion.
2 to 3 P.M. Ultraviolet Irradiation — KNAPP.
3 to 4 P.M. Fever Therapy — SCHMIDT.
4 to 5 P.M. Hydrotherapy — MOOR.
Dinner 5 to 7 P.M.
7 to 8 P.M. Therapeutic Exercise — EWERHARDT.
8 to 9 P.M. Infantile Paralysis — HANSSON.

SATURDAY, September 10

9 to 10 A.M. Low Frequency Currents — KOVACS.
10 to 11 A.M. Gynecology — McGUINNESS.
11 to 12 A.M. Fever Therapy Clinical Aspects — BIERMAN.
Luncheon Period, Round Table Discussion.
2 to 3 P.M. Light Therapy — TITUS.
3 to 4 P.M. Short Wave Diathermy — ZEITER.
4 to 5 P.M. Massage — CURRENCE.
Dinner 5 to 7 P.M.
7 to 8 P.M. Electrophoresis — HARPUDER.
8 to 9 P.M. General Discussion.

Registration by application only. The course is intended primarily for physicians but a limited number of technicians will be admitted. The fee will be $25; for members of the Congress $20.

GENERAL SCIENTIFIC SECTION

MONDAY, September 12, 10 A. M.

GRAND BALL ROOM

OFFICERS OF THE SECTION

Chairman — Frederick L. Wahrer, M.D., Marshalltown, Ia.
Secretary — Richard Kovács, M.D., New York.

101. Sciatic Syndrome and Its Treatment.
WILLIAM H. SCHMIDT, M.D., Associate Professor of Physical Therapy, Jefferson Medical College.
PHILADELPHIA.
Discussion: H. D. Holman, M.D., Mason City, Ia.; G. A. Zerzan, M.D., Holyrood, Kansas.

102. The Value of Exercise in the Control of Posture.
HELEN DOBSON DENNISTON, M.D., Associate Professor of Physical Education in Charge of Therapeutic Gymnastics, University of Wisconsin.
MADISON, WIS.
Discussion: F. H. Ewerhardt, M.D., St. Louis; K. G. Hansson, M.D., New York; Joseph E. Malcomson, M.D., Detroit.

103. Biological Effects of Therapeutic Fever.
MICHEL PIJOAN, M.D., Research Fellow in Surgery, The Harvard Medical School.
BOSTON, MASS.
Discussion: William Bierman, M.D., New York; Kenneth Phillips, M.D., Miami, Fla.

104. Iontophoresis, Indications and Technique.
FRANCES BAKER, M.D., Director of Physical Therapy Department, Instructor of Orthopedic Surgery, University of California.
SAN FRANCISCO.
Discussion: A. J. Kotkis, M.D., St. Louis; Joseph Kovács, M.D., New York; Emil G. Vrtiak, M.D., Chicago.

BUSINESS SESSION

MONDAY, September 12, 2 P. M.
ROOM 17 — CLUB FLOOR

I. Call to Order by the President, Frederick L. Wahrer, M.D.
II. Reading of Minutes
III. Reports of Committees
IV. Reports of:
(1) Executive Director
(2) Editor
(3) Treasurer
(4) Registrar (American Registry of Physical Therapy Technicians)
V. Old Business
VI. New Applications for Membership
VII. New Business
VIII. Election of Officers
IX. Good and Welfare

Economic Aspects of Physical Therapy.
RICHARD KOVACS, M.D.,
New York.

Report on the Spa Situation.
WALTER S. McCLELLAN, M.D.
Saratoga Springs, N. Y.

Adjournment

FORMAL OPENING SESSION

Monday, September 12, 8 P. M.

GRAND BALL ROOM

Frederick L. Wahrer, M.D., Marshalltown, Iowa, *Presiding*

INVOCATION

The Reverend E. J. Randall, S.T.D.
Superintendent, Episcopal City Missions
Chicago

ADDRESSES OF WELCOME

Robert Hayes, M.D.
President, Chicago Medical Society
Chicago

S. E. Munson, M.D.
Springfield
President, Illinois State Medical Society

INDUCTION OF THE PRESIDENT-ELECT

ADDRESS

The Contributions of Physical Therapy to Medicine

Frank H. Krusen, M.D.
Rochester, Minnesota

ADDRESS

Chronic Recurring Sciatica: Diagnosis and Treatment of Ruptured Intervertebral Disks

A. W. Adson, M.D.
Chief, Section on Neurosurgery, Mayo Clinic
Rochester, Minnesota

ADDRESS

Manipulative Surgery, a Challenge to the Medical Profession

G. Mosser Taylor, M.D.
Associate Professor of Orthopedic Surgery,
College of Medical Evangelists
Los Angeles, California

SECTION ON MEDICINE

TUESDAY, September 13, 9 A. M.

ROOM 14 — CLUB FLOOR

OFFICERS OF THE SECTION

Chairman — JOHN D. CURRENCE, M.D., New York.
Secretary — ALBERT A. MARTUCCI, M.D., Philadelphia.

201. Clinical Application of the Paraffin Bath.
WALTER J. ZEITER, M.D., Director of Physical Therapy, Cleveland Clinic.
CLEVELAND.

Discussion: Richard Kovács, M.D., New York; Paul Roth, M.D., Battle Creek.

202. The Treatment of Bright's Disease and Its Complications by Means of Internal Heat.
GEORGE WILLIAM STARK, M.D., Attending Urologist to Syracuse Memorial and St. Joseph's Hospitals.
SYRACUSE, N. Y.

Discussion: Jessie G. Jenkins, M.D., Temple, Texas; Carl G. Uthoff, M.D., Chicago.

203. The Effect of Natural Carbonated Mineral Water Baths on Pulse Rate, Pulse Amplitude and Blood Pressure.
SAMUEL A. DORRANCE, M.D.,
and
WALTER STUART McCLELLAN, M.D., Associate Professor of Medicine, Albany Medical College; Associate Attending Physician, Albany Hospital; Medical Director, Saratoga Spa.
SARATOGA SPRINGS, N. Y.

Discussion: A. B. Olsen, M.D., Battle Creek; Euclid Smith, M.D., Hot Springs, Ark.

204. The Treatment of Burns with Special Reference to Water Intoxication as a Complicating Factor.
HERBERT L. EGBERT, M.D., Fellow in Research, Indiana University School of Medicine.
INDIANAPOLIS.

Discussion: H. M. Trusler, M.D., Indianapolis; B. Billman, M.D., Cincinnati.

205. Manipulation in Low Back Cases.
I. F. HUMMON, JR., M.D., Assistant in Roentgenology, Loyola University School of Medicine; Attending Physical Therapist, Cook County Hospital.
CHICAGO.

Discussion: F. H. Ewerhardt, M.D., St. Louis; Edwin L. Libbert, M.D., Lawrenceburg, Ind.

SECTION ON SURGERY

TUESDAY, September 13, 9 A. M.

ROOM 18 — CLUB FLOOR

OFFICERS OF THE SECTION

Chairman — MADGE C. L. McGUINNESS, M.D., New York.
Secretary — JESSIE G. JENKINS, M.D., Temple, Texas.

211. Carcinoma of the Cervix: Early Diagnosis and Treatment.
JOHN WILLIAM HOFMANN, M.D., Associate Professor of Gynecology, Indiana University School of Medicine.
INDIANAPOLIS.

212. The Treatment of Chronic Cervicitis.
WILLIAM T. BLACK, M.D., Professor of Gynecology, University of Tennessee School of Medicine.
MEMPHIS, TENN.

Discussion of foregoing papers: A. J. Kobak, M.D., Chicago; A. D. Willmoth, M.D., Louisville; Melvin R. Roblee, M.D., St. Louis; William E. Ground, M.D., Superior, Wis.

213. Radiotherapy from the Viewpoint of the General Surgeon.
DON D. BOWERS, M.D., Assistant, Gynecology, Indiana University School of Medicine.
INDIANAPOLIS.

Discussion: Edwin N. Kime, M.D., Indianapolis; Gustavus M. Blech, M.D., Chicago.

214. Infra-Red Photography in the Diagnosis of Vascular Tumors.
FRANCESCO RONCHESE, M.D., Dermatologist, Rhode Island, Charles V. Chapin and St. Joseph Hospitals.
PROVIDENCE, R. I.

Discussion: Erwin P. Zeisler, M.D., Chicago; P. A. Deckard, M.D., Harrisburg, Pa.

215. Further Studies with Fango Therapy.
EMIL G. VRTIAK, M.D., Associate Clinical Professor of Medicine, Rush Medical College of the University of Chicago,
and
DISRAELI KOBAK, M.D., Assistant Clinical Professor of Medicine (Physical Therapy) Rush Medical College of the University of Chicago.
CHICAGO.

Discussion: Euclid Smith, M.D., Hot Springs, Ark.; Walter M. Solomon, M.D., Cleveland; Charles I. Singer, M.D., Long Beach, N. Y.

SECTION ON UROLOGY

TUESDAY, September 13, 9 A. M.

ROOM 15 — CLUB FLOOR

OFFICERS OF THE SECTION

Chairman — HU C. MYERS, M.D., Phillipi, W. Va.
Secretary — EDWIN W. HIRSCH, M.D., Chicago.

221. Short Wave Diathermy in Chronic Prostatitis: Preliminary Report.
DONALD K. HIBBS, M.D., Clinical Instructor in Urology, Northwestern University Medical School.
CHICAGO.

Discussion: Disraeli Kobak, M.D., Chicago; William J. Egan, M.D., Milwaukee; Norman E. Titus, M.D., New York.

222. Electrosurgical Treatment of Bladder Neoplasms.
HARRY CULVER, M.D., Associate Professor of Urology, Northwestern University Medical School.
CHICAGO.

Discussion: Gustav Kolischer, M.D., Chicago; Edwin W. Hirsch, M.D., Chicago.

SYMPOSIUM ON ELECTRORESECTION

223. Recent Developments in Transurethral Prostatectomy.
JOHN J. EMMETT, M.D., Assistant Professor of Urology, The Mayo Foundation, University of Minnesota.
ROCHESTER, MINN.

224. Personal Experiences with Prostatic Resection.
IRA SISK, M.D., Professor of Urology, University of Wisconsin Medical School.
MADISON, WIS.

225. Status of Transurethral Resection.
HARRY C. ROLNICK, M.D., Attending Urologist, Cook County, Michael Reese and Mount Sinai Hospitals.
CHICAGO.

Discussion: William L. Sherman, M.D., Eloise, Mich.; Russell D. Herrold, M.D., Chicago; Joseph E. F. Laibe, M.D., Chicago.

SECTION ON OPHTHALMOLOGY AND OTOLARYNGOLOGY

TUESDAY, September 13, 9 A. M.

ROOM 17 — CLUB FLOOR

OFFICERS OF THE SECTION

Chairman — Ellis G. Linn, M.D., Des Moines, Iowa.
Secretary — Farel Jouard, M.D., New York.

231. Present Status of the Hearing Aid Problem.

HORACE NEWHART, M.D., Director, Department of Oto-Rhino-Laryngology, University of Minnesota Medical School.

MINNEAPOLIS.

Discussion: Austin A. Hayden, M.D., Chicago; Frank J. Novak, M.D., Chicago.

232. Recent Trends Concerning the Importance of the Audiometer in Otology.

G. HENRY MUNDT, M.D.

CHICAGO.

Discussion: Meyer Gorin, M.D., Rochester, N. Y.; Frank E. Bryant, M.D., Minneapolis.

233. The Galvanic Vestibular Reaction.

SHERMAN L. SHAPIRO, M.D., Assistant Professor of Laryngology, Rhinology and Otology, University of Illinois College of Medicine.

CHICAGO.

Discussion: Carl B. Sputh, M.D., Indianapolis; Noah Fabricant, M.D., Chicago; Edwin J. Blonder, M.D., Chicago.

234. Cancer of the Head and Neck: Management of Lesions with Borderline Operability.

EDWIN N. KIME, M.D., Assistant Professor of Surgery, Indiana University School of Medicine.

INDIANAPOLIS.

Discussion: Thomas C. Galloway, M.D., Evanston, Ill.; Harold Trusler, M.D., Indianapolis; J. A. Haiman, M.D., New York.

235. Sinus Disease: Demonstration of Apparatus for Physiologic Rest to the Respiratory Tract.

LEWIS J. SILVERS, M.D., Otolaryngologist, Ocean Hill Memorial Hospital.

NEW YORK.

Discussion: A. J. Cone, M.D., St. Louis; Irwin G. Spiesman, M.D., Maywood, Ill.; O. E. Van Alyea, M.D., Chicago.

SECTION ON OPHTHALMOLOGY AND OTOLARYNGOLOGY

TUESDAY, September 13, 2 P. M.

ROOM 17 — CLUB FLOOR

OFFICERS OF THE SECTION

Chairman — Carl B. Sputh, M.D., Indianapolis.
Secretary — Lewis J. Silvers, M.D., New York.

236. The Fluorescent Lamp in Surgery of the Lens (Motion Picture).

H. ROMMEL HILDRETH, M.D., Instructor in Ophthalmology, Washington University School of Medicine.

ST. LOUIS, MO.

237. Theoretic and Practical Aspects of Iontophoretic Medication in Ophthalmology.

GUSTAV ERLANGER, M.D., Laboratory of Manhattan General Hospital.

NEW YORK.

Discussion: Samuel Meyer, M.D., Chicago; Maurice H. Cottle, M.D., Chicago.

SYMPOSIUM ON SHORT WAVE DIATHERMY

238. Short Wave Diathermy in Pyogenic Infections About the Head and Neck.

WILLIAM J. EGAN, M.D., Assistant Clinical Professor of Medicine, Marquette University School of Medicine.

MILWAUKEE.

239. Merits and Rationale of Short Wave Diathermy in Acute Sinusitis.

FAREL JOUARD, M.D., Lecturer in Otolaryngology, New York Polyclinic Medical School and Hospital.

NEW YORK.

240. Evaluation of Short Wave Diathermy in Ophthalmology and Otolaryngology.

MAURICE H. COTTLE, M.D., Otolaryngologist, Children's Memorial and Illinois Masonic Hospitals.

CHICAGO.

Discussion: Frederick L. Wahrer, M.D., Marshalltown, Ia.; H. J. Rubenstein, M.D., New York; Norman E. Titus, M.D., New York.

SECTION ON GASTROINTESTINAL DISEASES

TUESDAY, September 13, 9 A. M.

ROOM 9 — THIRD FLOOR

OFFICERS OF THE SECTION

Chairman — William Worster, M.D., San Gabriel, Calif.
Secretary — James W. Wiltsie, M.D., Binghamton, N. Y.

251. Ulcerative Colitis and Its Relation to Physical Therapy.

C. W. HEALD, M.D., Gastroenterological Department, Battle Creek Sanitarium.

BATTLE CREEK, MICH.

Discussion: Charles Drueck, M.D., Chicago; R. A. Case, M.D., Cleveland, Ohio.

252. Importance of Gastrointestinal Therapy in the Control and/ or Cure of Arthritis.

EPHRAIM GOLDFAIN, M.D., Associate in Neurology, University of Oklahoma School of Medicine.

OKLAHOMA CITY.

Discussion: Maurice F. Lautman, M.D., Hot Springs, Ark.; Eugene F. Traut, M.D., Chicago.

253. The Diagnostic and Therapeutic Value of Colonic Therapy in Toxic Conditions of Obscure Origin.

JAMES W. WILTSIE, M.D., Consultant in Physical Therapy, Binghamton City Hospital.

BINGHAMTON, N. Y.

Discussion: William Worster, M.D., San Gabriel, Calif.; John S. Hibben, M.D., Pasadena, Calif.

254. Colon Disease and Its Therapy in Relation to Chronic Arthritis.

ERNEST C. FISHBAUGH, M.D.

LOS ANGELES.

Discussion: Ephraim Goldfain, M.D., Oklahoma City; Willis W. Waite, M.D., El Paso, Texas.

255. Vascular Spasm in Experimental Gastric Ulcer.

ALEXANDER J. NEDZEL, M.D., Associate Professor in Pathology and Bacteriology, University of Illinois College of Medicine.

CHICAGO.

Discussion: Samuel Sedwitz, M.D., Youngstown, O.; Jerome Weiss, M.D., Brooklyn, N. Y.

GENERAL SCIENTIFIC SECTION

TUESDAY, September 13, 2 P. M.

GRAND BALL ROOM

OFFICERS OF THE SECTION

Chairman — RICHARD KOVÁCS, M.D., New York.
Secretary — ROY W. FOUTS, M.D., Omaha, Neb.

SYMPOSIUM ON PERIPHERAL VASCULAR DISEASES

241. Therapeutic Value of Passive Hyperemia in Peripheral Vascular Disease.

KARL HARPUDER, M.D., Assistant Clinical Professor of Medicine, Columbia University College of Physicians and Surgeons; Attending Physical Therapist, Montefiore Hospital.

NEW YORK.

242. Reestablishment of Circulation in the Blood Vessels of Extremities.

WILLIAM BRYAN KOUNTZ, M.D., Assistant Professor of Medicine, Washington University School of Medicine.

ST. LOUIS, MO.

243. Diagnostic Methods for Peripheral Vascular Disturbances.

PAUL MERRELL, M.D., Staff, General Surgery, Methodist, St. Vincent's and City Hospitals.

INDIANAPOLIS.

244. The Paraffin Bath as a Physiotherapeutic Adjunct in Vascular Diseases.

SAMUEL SEDWITZ, M.D., Attending Surgical Staff, Youngstown Hospital Association; Chief of Vascular Clinic, North Side Unit, Youngstown Hospital Association.

YOUNGSTOWN, O.

Discussion: Richard Kovács, M.D., New York; Madge C. L. McGuinness, M.D., New York; Louis G. Herrmann, M.D., Cincinnati; Gèza de Takats, M.D., Chicago; Heinrich Wolf, M.D., New York.

JOINT MEETING

American Congress of Physical Therapy
and
American Occupational Therapy Association

WEDNESDAY, September 14, 9 A. M.

GRAND BALL ROOM

OFFICERS OF THE SECTION

JOSEPH C. DOANE, M.D., *President*, American Occupational Therapy Association
FRANK H. KRUSEN, M.D., *President*, American Congress of Physical Therapy
} Co-Chairmen

301. The Mental Hygiene Aspect of Care of the Orthopaedic Patient.

EDWARD L. COMPERE, M.D., Orthopaedic Surgeon, University of Chicago Clinics.

CHICAGO.

302. The Psychological Importance of Play Therapy.

ANNE SMITH, Director, Recreational Therapy Institutes.

CHICAGO.

303. Correlation of Occupational Therapy and Physical Therapy.

Panel: GEORGE J. GARCEAU, M.D., Chief Orthopedic Surgeon, Riley Hospital, Indianapolis,

INDIANAPOLIS;

MISS CHARLOTTE W. ANDERSON, Chief Physical Therapist, Riley Hospital, Indianapolis,

INDIANAPOLIS;

and

MISS HENRIETTA McNARY, Director of Occupational Therapy, and Physical Therapy, Association for the Crippled and Disabled.

CLEVELAND, O.

304. Films Showing Use of Correlated Treatments.

Miss Marjorie Taylor, Milwaukee; Miss Henrietta McNary, Cleveland, O.; Mrs. Winifred C. Kahmann, Indianapolis; William R. Dunton, Jr., M.D. Catonsville, Md.

JOINT MEETING

American Congress of Physical Therapy
and
American Occupational Therapy Association

WEDNESDAY, September 14, 2 P. M.

GRAND BALL ROOM

OFFICERS OF THE SECTION

FRANK H. KRUSEN, M.D., *President*, American Congress of Physical Therapy
JOSEPH C. DOANE, M.D., *President*, American Occupational Therapy Association
} Co-Chairmen

305. Standards for Physical Therapy and Occupational Therapy Departments in a General Hospital.

MALCOLM T. MacEACHERN, M.D., Associate Director, American College of Surgeons; President of the International Hospital Association.

CHICAGO.

Discussion: Disraeli Kobak, M.D., Chicago; Richard Kovács, M.D., New York.

306. Occupational Therapy in Fractures.

HARRY E. MOCK, M.D., Associate Professor of Surgery, Northwestern University Medical School.

CHICAGO.

Discussion: Frank H. Krusen, M.D., Rochester, Minn.; Harold D. Corbusier, M.D., Plainfield, N. J.

307. Rehabilitation.

MADGE C. L. McGUINNESS, M.D., Director of Physical Therapy, Lenox Hill and Misericordia Hospitals.

NEW YORK.

Discussion: Joseph E. Malcomson, M.D., Detroit; N. H. Polmer, M.D., New Orleans.

308. The After Care of Infantile Paralysis: Braces and Operations.

FRANCIS CARF M.D., Orthopaedic Surgeon, New York State Department of Health; Assistant Orthopaedic Surgeon, Hospital for Ruptured and Crippled.

NEW YORK.

Discussion: Walter R. Fischer, M.D., Chicago; G. H. McKinstry, M.D., Washington, Pa.

GENERAL SCIENTIFIC SESSION

WEDNESDAY, September 14, 8 P. M.

GRAND BALL ROOM

OFFICERS OF THE SECTION

Chairman — Frank H. Krusen, M.D., Rochester, Minn.
Secretary — John S. Hibben, M.D., Pasadena, Calif.

311. Vasomotor Regulation of the Temperature of the Extremities in Health and Diseases.

CHARLES SHEARD, Ph.D.,
MARVIN M. D. WILLIAMS, Ph.D.,
and
B. T. HORTON, M.D.,
Division of Biophysical Research and the Division of Medicine, The Mayo Foundation and the Mayo Clinic.
ROCHESTER, MINN.

Discussion: James C. Elsom, M.D., Madison, Wis.; Jessie Wright, M.D., Pittsburgh, Pa.

312. Ultraviolet Treatment of Gastrointestinal Tuberculosis.

JOHN S. COULTER, M.D., Associate Professor of Physical Therapy, Northwestern University Medical School,
and
LEO L. HARDT, M.D., Associate Clinical Professor of Medicine, Loyola University School of Medicine.
CHICAGO.

Discussion: Allan J. Hruby, M.D., Chicago; A. L. Banyai, M.D., Wauwatosa, Wis.

313. The Teaching of Physical Therapy.

FRED BENNETT MOOR, M.D., Professor of Pharmacology and Therapeutics, School of Medicine, College of Medical Evangelists, Loma Linda, Calif.,
LOS ANGELES.
and
CLARENCE W. DAIL, M.D., Instructor of Pharmacology and Therapeutics, College of Medical Evangelists, Loma Linda, Calif.
LOMA LINDA, CALIF.

Discussion: William H. Schmidt, M.D., Philadelphia; William Bierman, M.D., New York.

SECTION ON FEVER THERAPY

THURSDAY, September 15, 9 A. M.

GRAND BALL ROOM

OFFICERS OF THE SECTION

Chairman — William Bierman, M.D., New York.
Secretary — N. H. Polmer, M.D., New Orleans.

401. General Management of Fever Therapy.

KENNETH PHILLIPS, M.D., Medical Director, Physical Therapy Centre; Chief, Medical Service, James M. Jackson Memorial Hospital.
MIAMI, FLA.

402. Fever-Sulfanilamide Therapy in Resistant Gonorrheal Infection.

JAMES HOWE BRITTON, M.D., Director Physical Therapy, Moline Public Hospital, Lutheran Memorial Hospital (Moline); Consultant, Fever Therapy, East Moline Hospital.
MOLINE, ILL.

403. Fever Therapy in Chorea.

LUCY PORTER SUTTON, M.D., Assistant Professor of Pediatrics, New York University Medical College.
NEW YORK.

404. Fever Therapy—Physiologic Effects.

MILTON G. SCHMITT, M.D., Clinical Assistant in Physical Therapy, Northwestern University Medical School; Director of Physical Therapy, Garfield Park Community Hospital.
CHICAGO.

405. Fever Therapy in Acute Rheumatic Fever.

F. LOWELL DUNN,, M.D., Assistant Professor in Clinical Physiology and Medicine, University of Nebraska College of Medicine,
and
EUGENE E. SIMMONS, M.D., Instructor in Medicine, University of Nebraska College of Medicine, Member of Executive Committee, University of Nebraska Fever Therapy Research Department.
OMAHA, NEB.

Discussion: Robert M. Stecher, M.D., Cleveland; William K. Ishmael, M.D., Oklahoma City; Madge C. L. McGuinness, M.D., New York; Walter M. Solomon, M.D., Cleveland; John R. Merriman, M.D., Evanston, Ill.; William H. Schmidt, M.D., Philadelphia; Stanton P. Hull, M.D., Troy, N. Y.

SECTION ON SURGERY

THURSDAY, September 15, 9 A. M.

ROOM 18 — CLUB FLOOR

OFFICERS OF THE SECTION

Chairman — Miland E. Knapp, M.D., Minneapolis.
Secretary — B. S. Troedsson, M.D., Orange, N. J.

411. Post-traumatic Painful Atrophy of Joints.

RALPH GHORMLEY, M.D., Professor of Orthopaedic Surgery, The Mayo Foundation, Associate in Orthopaedic Surgery, The Mayo Clinic.
ROCHESTER, MINN.

412. Fractured Hips in the Aged. Improved Prognosis with the Use of Physical Therapy.

THEODORE P. BROOKES, M.D., Assistant Professor of Clinical Orthopaedic Surgery, Washington University School of Medicine;
and
FRANK H. EWERHARDT, M.D., Professor of Physical Education; Assistant Professor of Physical Therapy; Director Student Health Service, Washington University School of Medicine.
ST. LOUIS, MO.

413. Villous Synovitis in the Knees Due to Faulty Weight Distribution.

JOHN P. STUMP, M.D., Assistant Attending Orthopaedic Surgeon, Post Graduate Hospital.
NEW YORK.

414. Mecholyl-Ionization in the Treatment of Arthritis.

DOUGLAS BOYD, M.D., Instructor in Medicine (Arthritis Unit) Northwestern University Medical School.
HIGHLAND PARK, ILL.

415. Treatment of Periarthritis of the Shoulder.

J. I. KENDRICK, M.D., Department of Orthopaedic Surgery, Cleveland Clinic.
CLEVELAND, O.

Discussion: Philip K. Lewin, M.D., Chicago; Val Parmley, M.D., Little Rock; Ben L. Boynton, M.D., Madison, Wis.; B. S. Troedsson, M.D., Orange, N. J.; Jessie Wright, M.D., Pittsburgh, Pa.; Euclid Smith, M.D., Hot Springs; A. J. Kotkis, M.D., St. Louis.

SECTION ON MISCELLANEOUS SUBJECTS

THURSDAY, September 15, 9 A. M.

ROOM 14 — CLUB FLOOR

OFFICERS OF THE SECTION

Chairman — B. Billman, M.D., Cincinnati.
Secretary — A. B. Olsen, M.D., Battle Creek.

421. Skin Protection Against Ultraviolet Rays.
ALBERT BACHEM, Ph.D., Professor of Biophysics, University of Illinois College of Medicine;
and
BERNARD FANTUS, M.D., Professor of Therapeutics, University of Illinois College of Medicine.
CHICAGO.

Discussion: W. T. Anderson, Jr., Ph.D., Newark, N. J.; Fred B. Moor, M.D., Los Angeles, Calif.

422. Experiences With Thin Window Mercury Glow Lamp: Preliminary Report.
RICHARD KOVACS, M.D., Clinical Professor of Physical Therapy, New York Polyclinic Medical School and Hospital.
NEW YORK.

Discussion: Albert A. Martucci, M.D., Philadelphia; Albert Bachem, Ph.D., Chicago.

423. A New Form of Post-Injury Treatment.
ESTHER FRANKEL, M.D., Clinical Associate in Physical Therapy, Rush Medical College of the University of Chicago.
CHICAGO.

Discussion: Disraeli Kobak, M.D., Chicago; James C. Elsom, M.D., Madison.

424. Measurement of Power of Short Wave Diathermy Machines.
HOWARD A. CARTER, B.S. in M.E., Secretary, Council on Physical Therapy, American Medical Association.
CHICAGO.

425. Modern Concepts of Dosage in Short Wave Diathermy.
NORMAN E. TITUS, M.D.
NEW YORK.

Discussion: Disraeli Kobak, M.D., Chicago; R. M. Stecher, M.D., Cleveland.

SECTION ON OPHTHALMOLOGY AND OTOLARYNGOLOGY

THURSDAY, September 15, 9 A. M.

ROOM 17 — CLUB FLOOR

OFFICERS OF THE SECTION

Chairman — Frederick L. Wahrer, M.D., Marshalltown, Ia.
Secretary — Oscar B. Nugent, M.D., Chicago.

431. Relationships Between Accommodation and Convergence and Their Clinical Significance.
CHARLES SHEARD, Ph.D., Division of Biophysical Research, Mayo Foundation.
ROCHESTER, MINN.

Discussion: Philip Halper, M.D., Chicago; George Woodruff, M.D., Joliet, Illinois.

432. Ultraviolet Light in Corneal Ulcers.
ELLIS G. LINN, M.D., Iowa Methodist and Iowa Lutheran Hospitals.
DES MOINES, IOWA.

Discussion: Oscar B. Nugent, M.D., Chicago; James E. Lebensohn, M.D., Chicago.

433. X-Ray Therapy in Otolaryngologic Infections.
ALBERT F. TYLER, M.D.
OMAHA, NEB.

Discussion: John H. Gilmore, M.D., Chicago; Roy W. Touts, M.D., Omaha, Neb.

434. Direct Intraesophageal Treatment of Esophagospasm with Sinusoidal Current.
M. J. MANDELBAUM, M.D., Bronchoscopist, Hospital for Joint Diseases.
NEW YORK.

Discussion: Louis Zolo Fishman, M.D., Chicago; H. L. Sinskey, M.D., Baltimore; A. Ettleson, M.D., Chicago.

435. Climate in Relation to Upper Respiratory Infections.
C. H. GELLENTHIEN, M.D., Medical Director, Valmora Sanitorium.
VALMORA, NEW MEXICO.

Discussion: Walter S. McClellan, M.D., Saratoga Springs, New York; Meyer Gorin, M.D., Rochester, N. Y.

GENERAL SCIENTIFIC SESSION

THURSDAY, September 15, 2 P. M.

GRAND BALL ROOM

OFFICERS OF THE SECTION

Chairman — Frank H. Krusen, M.D., Rochester, Minn.
Secretary — Euclid Smith, M.D., Hot Springs, Arkansas.

441. Physical Therapy of Endocrinopathies.
JAMES H. HUTTON, M.D., *Chairman*, Educational Committee, Illinois State Medical Society; *President-Elect*, Illinois State Medical Society.
CHICAGO.

Discussion: John D. Currence, M.D., New York; Albert A. Martucci, M.D., Philadelphia.

442. The General Principles of Electrotherapy of Peripheral Nerve Lesions.
CHARLES O. FIERTZ, M.D., Instructor in Neurology, New York Post-Graduate Medical School.
NEW YORK.

Discussion: L. A. Tarbell, M.D., New Haven, Conn.; Jerome Weiss, M.D., Brooklyn, N. Y.

443. Important Technical Points in Electrosurgery.
GUSTAV KOLISCHER, M.D., Senior Urologist, Michael Reese and Mount Sinai Hospitals.
CHICAGO.

Discussion: Gustavus M. Blech, M.D., Chicago; Edwin N. Kime, M.D., Indianapolis; Albert F. Tyler, M.D., Omaha, Neb.

444. Physical Therapy in Relation to Public Health.
HERMAN N. BUNDESEN, M.D., *President*, Board of Health, City of Chicago.
CHICAGO.

Discussion: C. H. Gellenthien, M.D., Valmora, New Mexico; Wm. I. Fishbein, M.D., Chicago.

445. Effect of Ultraviolet and Visible Rays Upon Animal Septicemia.
ALEXANDER J. NEDZEL, M.D., Associate Professor in Pathology and Bacteriology, University of Illinois College of Medicine,
and
LUDWIG PINCUSSEN, Ph.D., M.D., Research Associate, Department of Physiology, University of Illinois College of Medicine.
CHICAGO.

Discussion: Norman E. Titus, M.D., New York; Miland E. Knapp, M.D., Minneapolis; M. J. Dorcas, Ph.D., Cleveland, O.

MOTION PICTURE THEATRE

ROOM 9 — THIRD FLOOR

(Each day from 1 to 1:45 P.M.)

SCHEDULE OF DAILY ACTIVITIES

22nd Annual Session
American Occupational Therapy Association

SUNDAY, September 11

2 P.M. Meeting of the Board of Management—Room 11, 3rd floor.
8 P.M. Meeting of the State and Regional Delegates—Room 11, 3rd floor.

MONDAY, September 12

8 A.M. Registration.
10 A.M. Round Tables (to run concurrently)—Room 10, 3rd floor.
(a) Student Training.
(b) Profitable Utilization of Auxiliary Groups.
(c) Nurses' Courses.
(d) Techniques and Equipment in Treatment.
(e) Recreational Therapy.
11:15 A.M. Report of Round Table Secretaries.
12 to 2 P.M. Luncheon and Inspection of Exhibits.
2 P.M. OPENING SESSION—Room 10, 3rd floor.
4:30 P.M. Tea—Art Institute—Illinois Occupational Therapy Association.

TUESDAY, September 13

8 A.M. Registration.
9 A.M. BUSINESS SESSION—Room 10, 3rd floor.
12 to 2 P.M. Luncheon and Inspection of Exhibits.
2 to 5 P.M. GENERAL SESSION—Room 10, 3rd floor.
5 to 6 P.M. Inspection of Exhibits.
6:30 P.M. ANNUAL DINNER—American Occupational Therapy Association, JOINTLY with the American Congress of Physical Therapy—Red Lacquer Room.

WEDNESDAY, September 14

8 A.M. Registration.
9 to 12 Noon. JOINT MEETING, American Occupational Therapy Association, and the American Congress of Physical Therapy—Grand Ball Room.
12 to 2 P.M. Luncheon and Inspection of Exhibits.
2 to 4:30 P.M. JOINT MEETING, continued—Grand Ball Room.
4:30 P.M. OFFICIAL MEETING, House of Delegates—Room 10, 3rd floor.
6 to 8 P.M. Dinner.
8 P.M. Second Meeting of the Board of Managers including new members—Room 10, 3rd floor.

THURSDAY, September 15

8 A.M. Registration.
9 to 12 Noon. Field Trips.
12 Noon. Luncheon—Billings Hospital, Guests, University of Chicago Clinics.

PROGRAM

TWENTY-SECOND ANNUAL MEETING

American Occupational Therapy Association

SUNDAY, September 11

2 P.M. Meeting Board of Management—Room 10, 3rd floor.

8 P.M. Meeting of State and Regional Delegates—Room 11, 3rd floor.

Both Delegates and Alternates will be required to present credentials in writing from their local groups.

MONDAY September 12

10 A.M. Round-Tables (to run concurrently)—Room 10, 3rd floor.

1. Student Training.
Leader — WINIFRED M. SMITH O.T.Reg., Director, Occupational Therapy, Maine General Hospital. PORTLAND, MAINE.

Discussants for Schools: Mrs. Marjorie B. Greene; Miss Helen Willard, O.T.Reg.; Miss Geraldine R. Lermit, O.T.Reg.; Miss Marjorie Taylor, O.T.Reg.

Discussant for Students: Miss Ruth Bell, Milwaukee Goodwill Industries, Milwaukee.

Secretary: Miss Marjorie Fish, O.T.Reg., Field Secretary, Boston School of Occupational Therapy, Boston, Mass.

2. Profitable Utilization of Auxiliary Groups.
Leader — MISS CATHERINE E. NOURSE, O.T.Reg., Director, Occupational Therapy, Sarah Morris Hospital (Michael Reese). CHICAGO.

Discussant: Mrs. Alexander C. Eschweiler, Jr., Milwaukee.

Secretary: Miss Jane E. Myers, O.T.Reg., Director, Occupational Therapy, Scottish Rite Hospital for Crippled Children, Dallas, Texas.

3. Nurses' Courses.
Leader — MISS FRANCES E. WOOD, O.T.Reg., Director, Occupational Therapy, McLean Hospital. WAVERLEY, MASS.

Discussant: Miss Beatrice D. Wade, O.T.Reg., Director, Occupational Therapy, Illinois State School of Psychiatric Nursing, Chicago.

Secretary: Miss Lucy G. Morse, O.T.Reg., Director, Occupational Therapy, Massachusetts General Hospital, Boston, Mass.

4. Techniques and Equipment in Treatment.
Leader — MISS ELIZABETH K. WISE, O.T.Reg., Director, Occupational Therapy, Industrial Workshops. ROCHESTER, N. Y.

Discussant: Miss Marion L. Clark, O.T.Reg., Director, Curative Workshop, St. Louis School of Occupational Therapy, St. Louis, Mo.

Secretary: Mrs. Carolyn B. Brinn, O.T.Reg., Supervisor of Occupational Therapy, Junior League Curative Workshop, Milwaukee.

11:15 A.M. Reports of Round Table Secretaries to entire group.

OPENING SESSION

Monday, September 12, 2 P. M.

ROOM 10 — 3rd FLOOR

Call to Order by President of Association

Joseph C. Doane, M.D.
Medical Director, Jewish Hospital, Philadelphia

INVOCATION

Reverend Harold Leonard Bowman
Pastor, The First Presbyterian Church

GREETINGS
American Congress of Physical Therapy

Frank H. Krusen, M.D.
President-Elect
Mayo Clinic, Rochester, Minn.

ADDRESS

Joseph C. Doane, M.D.
President, American Occupational Therapy Association

1. Recent Advances in the Treatment of Tuberculosis.
ANDREW L. BANYAI, M.D., Clinical Director, Muirdale Sanitorium. WAUWATOSA, WIS.

2. Sanatorium Sequel.
MISS METTA BEAN, Director, Medical Social Service, Anti-Tuberculosis Association. MILWAUKEE.

3. **Industrial Program for the Tuberculous.**
MISS ELOISE S. YOUNG, Director of Rehabilitation, Sunnyacres.
WARRENSVILLE, O.

4:30 P.M.
Tea — Art Institute
Guests of Illinois Occupational Therapy Association

TUESDAY, September 13, 9 A. M.

ROOM 10 — 3rd FLOOR

BUSINESS SESSION (For Members Only).
Reports from Chairman of Standing Committees.
Report of Secretary-Treasurer.
Report of Special Committees.
Examination for Admission to Register.
Constitution Committee.
Discussion and Vote on New Constitution.
Unofficial Delegates Meeting.
Election of Officers.
New Business.

TUESDAY, September 13, 2 P. M.

ROOM 10 — 3rd FLOOR

Presiding: MR. EVERETT S. ELWOOD, Vice-President, American Occupational Therapy Association.

Mental Hygiene Aspects of Occupational Therapy.
GEORGE J. MOHR, M.D., University of Illinois College of Medicine.
CHICAGO.

The Shock Treatment for the Mentally Ill.
A. A. LOW, M.D., Assistant Director, Department of Psychiatry, University of Illinois College of Medicine.
CHICAGO.

An Occupational Therapy Program for Patients Under This Treatment.
MARY F. McDONOUGH, O.T.Reg., Director, Occupational Therapy, Milwaukee County Hospital.
WAUWATOSA, WIS.

An Industrial Program for Mental Patients.
Panel: O. R. YODER, M.D., Assistant Medical Superintendent, Ypsilanti State Hospital,
and
MARY E. BLACK, O.T.Reg., Director of Occupational Therapy, Ypsilanti State Hospital.
YPSILANTI, MICH.

Discussants:
Pro: Mr. A. Edwin Canterbury, O.T.Reg., Director of Occupational Therapy, Allegheny County Home, Woodville, Pa.
Con: Mrs. Theresa E. Pratt, O. T. Reg., Chief Occupational Therapist, Buffalo State Hospital, Buffalo, N. Y.

WEDNESDAY, September 14, 9 A.M.

JOINT MEETING with American Congress of Physical Therapy (see page 515)

4:20 P. M.

Official meeting of the House of Delegates to elect Board of Representatives before the second meeting of the Board of Managers meeting this evening.

8 P. M.

Second meeting of the Board of Managers including new members.

THURSDAY, September 15

FIELD TRIPS —
Spaulding School for Crippled Children.
Hull House.
Daniel House (A Sheltered Workshop for Handicapped).
University of Chicago Hospitals.
Illinois State School for Psychiatric Nursing.
University of Chicago Clinics (including Orthogenic School).
Sarah Morris Hospital for Children.
Wynnefield T. B. Hospital.
Cook County Hospital.
Michael Reese Hospital.
Presbyterian Hospital.
Research and Educational Hospital.
Wrigley Building.
Civic Opera.
Merchandise Mart.
Taft Studios.

12 Noon

Luncheon as guests of the University of Chicago at Billings with tours and special feature program! Rockefeller Institute with the famous Carrillons in concert!

SCIENTIFIC EXHIBITS

DR. EDWARD F. HARTUNG, DR. JOHN D. CURRENCE, and MISS MARGARET STRAUB NEIL, New York.
Social Aspects of Chronic Rheumatism.

DR. EDWARD F. HARTUNG, LOUISE JOHNSON, A.B., JESSIE R. McKELVEY, B.S., and MARJORIE WINTER, B.S., M.A., New York.
Posture Grading in the Treatment of Chronic Rheumatism.

VETERANS ADMINISTRATION, Washington, D. C.
Charts Showing Physical Therapy Methods and Results: Recreational therapy for the distinctive needs of the mentally ill.

DR. JOSEPH KOVÁCS, Post Graduate Medical School and Hospital, Vascular and Arthritis Clinics, New York.
Circulation Time Measurements and Anthropometric Studies in Chronic Arthritis: Circulation time measurements in arthritis. Comparative study of circulation time in normal individuals and in arthritics. Study of relation of circulation time and systolic — diastolic blood pressure and circulation time and sedimentation rate. Anthropometric measurements in rheumatoid and osteoarthritis. Average results in 50 rheumatoid and 50 osteoarthritic patients.

DR. FRED B. MOOR, Department of Pharmacology and Therapeutics, College of Medical Evangelists, Los Angeles.
Teaching of Physical Therapy: Photographs and description of special equipment for the teaching of physical therapy, outline of the personnel, the physical therapy curriculum; an exhibit of notebooks and other teaching material; illustrations of experimental studies carried on during the second year; clinical and didactic teaching of the senior year; motion picture of some of the experimental work.

DR. I. GOLDMERSTEIN, Paris, France, and PROFESSOR K. STODIECK, Berlin, Germany.
Climate to Order: Showing a Climatorium with pools, beaches, "sunlight," sports sections, treatment rooms, etc.; graphs to show the effect of climate upon vascular diseases.

DR. MADGE C. L. McGUINNESS, New York.
Effect of Climate on Health. Man's Environment. Prevention of Disease. Resistance. Therapy. Adaptation. "Everybody talks about the Weather," according to Mark Twain, why not do something about it? Climate to Order. Houses of the Future.

DR. CHARLES I. SINGER, Long Beach, N. Y.
Climatotherapy on Seashores: Statistics, graphs, photographs depicting therapeutic evaluation of sea-shore climate.

DR. A. J. NEDZEL, Department of Pathology and Bacteriology, University of Illinois College of Medicine, Chicago.
Pressor Episodes and Localization of Some Diseases (Experimentally produced): Pitressin injections cause a rise in blood pressure (followed by fall, evoked by constrictions of the finer arterioles and capillaries). It is similar to the constant changes of the blood pressure levels meteorologically conditioned (Petersen).
The inducing of pressor episodes in dogs made it possible to observe development of endocarditis and gastric ulcer.

Certain changes in central nervous system were also found. The bacteria, introduced into the bloodstream after pressor episodes, were found to localize on the heart valve and in the central nervous system.

These findings are illustrated by gross and microscopical specimen and by microphotographs and graphs.

DR. GEORGE MILLES, Department of Pathology, Bacteriology, and Public Health, University of Illinois College of Medicine, Chicago.

Relationship of Meteorological Fluctuations to the Clinical Occurrence of Hemorrhage and Perforation in Peptic Ulcer.

DR. JOHN S. HOWE, Department of Pathology and Bacteriology, University of Illinois College of Medicine, Chicago.

Meteorological Problems in Tuberculosis: Graphs, showing a definite correlation between the quantitative variations in the tuberculin reaction and the state of the peripheral vessels. The vascular pressor episodes are reflected in variations in the tuberculin reaction in serological changes and also in clinical symptoms.

FREDERICK SARGENT, Phillips Exeter Academy.

Weather Changes and the Onset of "Colds." The onset of colds in normal college students is definitely associated with the passage of the so-called polar front. The large number of colds occur with the beginning of this atmospheric change and a small number following the barometric crest. There are differences in the reactions with the different seasons. The studies are illustrated by charts.

AMERICAN PHYSIOTHERAPY ASSOCIATION.

History of Physical Therapy.

AMERICAN OCCUPATIONAL THERAPY ASSOCIATION.

The scientific exhibit of the American Occupational Therapy Association is designed to serve the members of the American Congress of Physical Therapy and all other allied and interested groups. Newly approved standards by the American Medical Association for the training of registered Occupational Therapists will be displayed. Occupational Therapy and its correlation to Physical Therapy will be shown through charts and moving pictures. The field of Tuberculosis, Mental Disease, Cardiac conditions, as well as courses for Nurses, and current and professional publications will be exhibited.

AMERICAN REGISTRY OF PHYSICAL THERAPY TECHNICIANS.

Charts of data showing requirements for certification; standards of education and training of technicians.

CHICAGO MUNICIPAL TUBERCULOSIS SANITARIUM.

Ultraviolet Treatment of Gastrointestinal Tuberculosis.

DR. G. MOSSER TAYLOR, Los Angeles.

Manipulative Surgery. Charts, drawings and colored motion pictures.

AMERICAN MEDICAL ASSOCIATION, COUNCIL ON PHYSICAL THERAPY.

Short demonstrational lectures of fifteen to twenty minutes each on physics as related to practice of Physical Therapy. Apparatus, charts and other equipment will be used in the demonstrations; charts bearing on the Council's educational program.

DR. PHILIP LEWIN, Chicago.

The Interrelation of Orthopaedic Surgery and Physical Therapy.

DR. HEINRICH WOLF, New York.

Experimental Evidence of the Local Control of the Peripheral Circulation and Demonstration of the Function of Antidromic Fibres in Man.

DR. OSCAR B. NUGENT, Chicago Eye, Ear, Nose and Throat Hospital, Chicago.

The magnetic extraction of foreign bodies with the use of diathermy or coagulation following to prevent detachment of the retina. Various pathological conditions of the eye and adnexa treated by coagulation or the various forms of diathermy current.

DR. J. C. ELSOM, and DR. BEN L. BOYNTON, Department of Radiology and Physical Therapy, University of Wisconsin Medical School, Madison, Wis.

Relation of Cabinet Humidity and Cabinet Temperature in Fever Therapy: A clinical study of the effect of variations in the humidity on the cabinet temperature necessary to maintain a patient's temperature at 104 F.

DR. HELEN DOBSON DENNISTON, University of Wisconsin, Madison, Wis.

A Method of Testing the Height of Pronation of the Arch: A demonstration to show an objective method of measuring the height of the long arch and the degree of pronation of the foot.

DR. A. W. ADSON, Department of Neurosurgery, in collaboration with the Departments of Roentgenology and Neurology, Mayo Clinic, Rochester, Minn.

Intraspinal Tumors and Intraspinal Protrusions of Intervertebral Disks. Diagnosis, surgery and surgical findings.

DR. O. L. HUDDLESTON, University of Colorado, DR. E. J. BALDES, and DR. FRANK H. KRUSEN, Mayo Clinic, Rochester, Minn.

A Study of Pulse Tracings and Cardiac Activity During Artificial Hyperpyrexia: Apparatus will be shown, tracings will be demonstrated, and analyses of the findings will be charted.

DR. FRANK H. KRUSEN, DR. WILLIAM C. BASOM, Mayo Clinic, Rochester, Minn.

Physical Therapy in Relation to Certain Aspects of Low Back Pain: There will be described the indications and contraindications to the use of physical measures in the treatment of certain spinal lesions. Illustrative material will be shown.

DR. FRANK H. KRUSEN, DR. E. C. ELKINS, and DR. R. L. BENNETT, Mayo Clinic, Rochester, Minn.

Practical Aspects of Skin Temperature Studies in the Constant Temperature Room in Relation to Physical Therapy: Charts indicating skin temperature changes as produced by applications of radiant heat and by diathermy will be shown and points of significance will be demonstrated.

DR. HENRY W. MEYERDING, Mayo Clinic, Rochester, Minn.

Spondylolisthesis, An Etiologic Factor in Backache: Exhibit consisting of (1) roentgenograms illustrating site and extent of deformity and postoperative surgical fusion; (2) anatomic models in wax demonstrating defects and surgical treatment; (3) motion pictures illustrating various deformities encountered on inspection of the spine, extent of limitation of motion and phases of conservative and surgical treatment.

DR. CHARLES SHEARD, DR. MARVIN M. D. WILLIAMS, and DR. BAYARD T. HORTON, Mayo Clinic, Rochester, Minn.

Vasomotor Regulation of the Temperatures of the Extremities in Health and Disease: Exhibit of charts and diagrams showing the results of physicophysiologic and clinical investigations concerning (1) surveys of skin temperatures of various portions of the body; (2) degree of vasoconstriction as evidenced in the effects produced on skin temperatures by changes of environmental conditions; (3) effects of ingestion of food on the temperatures of the extremities; (4) relative roles of upper and lower extremities in the regulation of loss of heat from the body in environments ranging from 60 to 95 F.; (5) comparison of results obtained on normal individuals with observations on subjects with peripheral vascular diseases.

DR. CARL JOHNSON, Circulatory Group of St. Luke's Hospital, Chicago.

Peripheral Circulation: The measurement of the peripheral circulation by means of the Digital Plethysmograph will be demonstrated. The effects of local heat, general heat, and foreign protein therapy on the peripheral circulation will be illustrated by lantern slides and transparencies. Case reports of patients having functional occlusion of the

peripheral circulation will be given and the records compared with those having organic occlusion. The method used should be very valuable in estimating the various therapeutic procedures upon the peripheral vascular circulation.

DR. K. HARPUDER, and DR. I. D. STEIN, Montefiore Hospital, New York.

Capillary Microphotographs in Peripheral Vascular Disease.

THE VOLTA BUREAU, Washington, D. C.

A philanthropic center established in 1887 by Alexander Graham Bell for the increase and diffusion of knowledge relating to the deaf; distributes free reprints and answers inquiries relative to deafness except medical inquiries; maintains a reference library on education and rehabilitation of the deaf and the hard of hearing.

S. L. OSBORNE, B.P.E., DR. MILTON G. SCHMITT, and DR. JOHN R. MERRIMAN, Northwestern University Medical School, Chicago.

Physiologic Effects of Fever Therapy.

DR. A. F. TYLER, and DR. FRANCIS L. SIMONDS, Omaha, Neb.

Therapy of Cutaneous Lesions: Motion picture film in natural color depicting various lesions amenable to radiation therapy, the skin reactions produced by the different techniques and results obtained by various methods; also effects on tissues.

DR. MILTON G. SCHMITT, Northwestern University Medical School, Chicago.

Photographic Presentation of Technique in Support of the Determinants of Adequate Dosage.

DR. JOHN P. STUMP, Arthritis and Orthopedic Clinics of New York Postgraduate Hospital, New York.

The Prevention of Arthritic Deformities by Early Orthopaedic Management.

DR. SAMUEL H. SEDWITZ, Youngstown, Ohio.

Demonstration of various tests with diagnosis of peripheral vascular diseases. These include graphic, sphygmotonometer, oscillometric, and surface temperature readings, circulation time tests, histamine tests, and sodium nitrite tests; also tests available to the general practitioner who does not have need for these diagnostic apparatus.

TECHNICAL EXHIBITS

Space No. 26 and 27

THE ADLANCO X-RAY CORPORATION.

Original Siemens Ultratherm with patented Schliephake glass condenser electrodes; also the Heliosphere X-Ray Unit for fluoroscopy and radiography for the general practitioner. Complete line of accessories.

Space No. 38

AMERICAN HOSPITAL SUPPLY CORPORATION.

Tomac Oxygen Therapy Equipment, Sanders Vasoscillator, Baxter Specialties.

Space No. 25

AMPEREX ELECTRONIC PRODUCTS, INC.

A full display of High Frequency Power Tubes suitable for use in short wave diathermy apparatus.

Space No. 60

ARCHIVES OF PHYSICAL THERAPY

Official publication of the American Congress of Physical Therapy will be on display.

Space No. 41

BECK-LEE CORPORATION.

ELECTRO-CARDIOGRAPHS designed by Charles F. Hindle. This apparatus is especially noteworthy because of its advanced mechanical principles and its facility for use.

Space No. 5, 6 and 7

BURDICK CORPORATION.

A complete line of physical therapy equipment including short wave diathermy apparatus built in metal cabinets; also new developments in ultraviolet radiation equipment. Doctors are invited to register for the Burdick Syllabus, a periodical of abstracts from current medical literature on physical therapy.

Space No. 69

THE CAMERON HEARTOMETER COMPANY.

The new Heartometer, a scientific precision instrument for permanent recording of a perfect pulse count and an accurate systolic and diastolic blood pressure reading. It also produces a graph which records the condition of the nerves, valves and muscle of the heart, showing many heart disorders in their earliest and advanced stages.

Space No. 48

THE CAMERON SURGICAL SPECIALTY COMPANY.

The new and inexpensive models of Cameron Cauterodyne (Radio Frequency), providing safe and effective cutting, coagulation, desiccating and fulgurating with a quick-healing, bloodless field for all classes of surgery. Latest developments in electrically lighted lamps and instruments for all phases of surgery and diagnosis will also be demonstrated.

Space No. 64

CHICAGO MEDICAL BOOK COMPANY.

Chicago Medical Book Company, Medical Booksellers, Publishers and Importers. Carry practically all new American and English publications in stock. Physicians practicing physical therapy find this service particularly valuable as authoritative works are always available, and immediate cooperation is furnished when other phases of scientific medicine are being explored as they continually must be by the modern physical therapist. Ask for new bulletin.

Space No. 35

THE COCA-COLA COMPANY.

Coca-Cola will be served to the delegates of the American Congress of Physical Therapy with the compliments of the Coca-Cola Company.

Space No. 46

DIERKER COMPANY — MANUFACTURERS.

Dierker Therapeutic Apparatus for administering treatments and medication to accessible cavities; reprints of scientific papers by eminent clinicians, who are users of the Dierker Apparatus, will be available upon request. Ask your local dealer to supply you.

Space No. 4

DOMORE CHAIR COMPANY, INC.

DoMore exhibits an adjustable executive chair for the business man that provides added comfort through a reclining back when one does not wish to sit erect at the desk. For office workers is shown the Air Duct Do/More, with the ventilated seat and back in cushion type upholstery. Through adjustments these chairs are "tailor made" at your desk.

Space No. 59

FANGO CORPORATION OF AMERICA

Exhibit of Fango di Battaglia, the natural volcanic deposit, used universally in the application of MOIST PENETRATING HEAT packs in arthritic and allied disorders.

Space No. 20, 21 and 22

H. G. FISCHER & COMPANY.

New models of apparatus will include the FISCHER Model "G" Shockproof Fluoroscope with radiographic facilities; the new FISCHER Galvanic and Contractile Currents Generator. Included also will be other models of x-ray, short wave and ultraviolet apparatus.

Space No. 37

C. B. FLEET COMPANY, INC.

Fifty years of meritorious results are back of the name PHOSPHO-SODA (FLEET). Samples supplied on request.

Space No. 1 and 2

GENERAL ELECTRIC X-RAY CORPORATION.

Equipment for fever therapy will be shown — the Inductotherm and the G-E air conditioned all-metal Fever Cabinet. Physicians will find both the apparatus and the accompanying technical information extremely interesting.

Space No. 63

GENERAL RADIO THERAPY LABORATORIES.

New General Automatic Short Wave Therapy Instruments. New Beauty. Greater Power. Advanced Engineering. Exclusive Features — With Four of them Automatic.

Space No. 16 and 17

HANOVIA CHEMICAL & MFG. COMPANY.

See the many fundamental developments in the ultraviolet field; 6 Meter and 14 Meter Diathermy equipment of the latest design; Sollux Radiant Heat Lamps, in the new redesigned hospital model. Hanovia Safe-T-Aire equipment for sanitary air control by ultraviolet; as well as Hyperpyrexia equipment of improved design.

Space No. 8

HOLLAND-RANTOS COMPANY.

Specialties on display: RANTOS FEVER BAG — for maintaining body temperatures generated by hyperpyrexia apparatus; garments and bedding of RANTOSILK featherweight, waterproof sheeting; POWDEX VAGINAL INSUFFLATOR with Cinquarsen Powder for the modern dry treatment of Trichomonas Vaginitis, and solution for bladder instillation.

Space No. 33

C. COY HONSAKER.

Our latest Hydro-therapeutic Appliance, The Honsaker Hydro Eneciator for inducing Artificial Fever, at low surface temperature, also a new apparatus for vascular conditions and The Honsaker Colonic Lavagatory.

Space No. 3

ILLE ELECTRIC CORPORATION.

Will demonstrate how the care of infantile paralysis and osteoarthritis patients can be greatly improved by Currence Underwater Therapy Tanks with Hydro-Massage. They will also display an improved "Portable Whirlpool Bath" for extremities by Titus.

Space No. 61

PAUL E. JOHNSON, MANUFACTURERS.

Short and Ultra Short Wave Oscillators — Electrosurgical and Artificial Fever Equipment — Galvanic Current and Sine Wave Generators — Colonic Therapy Equipment — Body Grid and Orificial Cold Ultraviolet Ray Quartz Lamps — Water Cooled Lamps — Luminous-Infrared Ray Lamps — Carbon Arc Lamps — Solariums — Electrodes — Accessories — Etc. If you are after "QUALITY AND TRUE ECONOMY," see our line.

Space No. 9 and 10

JONES METABOLISM EQUIPMENT COMPANY.

Will feature the Jones MOTOR BASAL, the SUPER-BASAL, and the Automatic Nitrogen Determination Metabolism Equipment. Familiarize yourself with the new method for determining the "Normal" from the Nitrogen Metabolism. The SUPER-BASAL is an apparatus adjustable to the size of the patient.

Space No. 67

KENNISON HYDROTONE COLONIC CO.

Colonic Tables.

Space No. 34

LEPEL HIGH FREQUENCY LABORATORIES, INC.

Will exhibit a line of inexpensive tube operated short wave machines with an entirely new circuit; also our spark gap short wave machines and ultraviolet quartz lamps, as well as a new galvanic, faradic and sinusoidal generator.

Space No. 12

THE LIEBEL-FLARSHEIM COMPANY.

Complete line of the well-known L-F Short Wave Generators, as well as the famous Bovie Electro-Surgical Units. In addition, other new and useful physical therapy apparatus will be shown and demonstrated on request.

Space No. 66

R. J. LINDQUIST & COMPANY.

Chronaximeter for new methods in muscle testing. Chronowave Low Volt Generator. No Motors, no rotating parts. Completely controlled wave forms. A new contractile current based on tests of the normal chronaxia. Short Wave Diathermy Apparatus — Portable-console combination units. Desert Sun — Infrared and Ultraviolet Lamps.

Space No. 65

MAJESTIC SURGICAL INSTRUMENT COMPANY.

Examine the many features of the Majestic short wave unit accepted by American Medical Association and American College of Surgeons; guaranteed for three years; combines a portable unit with a mobile cabinet; inexpensive.

Space No. 39 and 40

McINTOSH ELECTRICAL CORPORATION.

Newer developments in short-wave diathermy equipment and representative selections of the complete McIntosh line of physical therapy apparatus will be presented. The new Polysine Generator will be shown for the first time. Be sure to see this and the Advance and Premier Model Brevatherms, the Modernistic Sinustat, and other apparatus in our line.

Space No. 68

THE C. V. MOSBY COMPANY

New books to be displayed are: Hollender's "Physical Therapeutic Methods in Otolaryngology;" Koll's "Medical Urology;" Shands' "Handbook of Orthopedic Surgery;" Key and Conwell's "Fractures, Dislocations and Sprains;" Crossen's "Operative Gynecology;" Macleod's "Physiology in Modern Medicine;" and Horsley and Bigger's "Operative Surgery." These are 1937 and 1938 releases — important medical contributions.

Space No. 19

NATIONAL CARBON COMPANY, INC.

An exhibit and demonstration of the newest models and latest developments in "Eveready" Professional Model Carbon Arc Lamps. See the new high intensity arcs — maximum efficiency — higher in ultraviolet output — quicker action — adaptable to a wide range of applications in light therapy. These modern units are attractive and easy to operate.

Space No. 18

PEERLESS LABORATORIES, INC.

Will exhibit their new short and ultra short wave apparatus. They will also show their new "ALL PURPOSE FLUOROSCOPIC RADIOGRAPHIC UNIT," in addition to a new portable static generator without revolving plates.

Space No. 15

PHILIP MORRIS & COMPANY, LTD., INC.

Demonstration of the method by which it was found that Philip Morris cigarettes, in which diethylene glycol is used as the hygroscopic agent, are less irritating than other cigarettes. Their representative will be happy to discuss researches and problems on the physiological effects of smoking.

Space No. 31 and 32

PROFESSIONAL EQUIPMENT COMPANY.

As exclusive distributors for the Fischer Corporation of Glendale, Calif., offers a complete line of modern therapeutic and diagnostic equipment including Ultraviolet, Short Wave, Galvanic and Sine Wave, Electrocardiographic, and X-Ray apparatus.

Space No. 47

E. J. ROSE MANUFACTURING COMPANY, INC.

The new Allsion pH Meter, biological model, a radical innovation in pH determination by electrometric methods. In addition, the current line of short wave units and pertaining devices will be displayed, as well as an utterly new departure in cold quartz lamps. A new convention policy prohibiting floor sales is established to further the true educational purpose of the exhibit.

Space No. 55 and 56

THERAPEUTIC APPLIANCE CORPORATION.

The Humiditherm possesses features for maximum efficiency such as automatic control and ease of treatment. Apparatus is modern in design and in engineering appointments and has been found highly satisfactory for every form of fever therapy.

Space No. 62

THERMO-ELECTRIC COMPANY.

Paraffin Baths, electrically heated, have been developed in Cleveland Hospitals, and used continuously for several years. The perfected positive controls of the melting and operating elements keep the bath ready for use at all times. Tub of Stainless Metal. Casing of Chrome Plate steel. Used whenever heat application is indicated for extremities.

Space No. 11

WESTINGHOUSE X-RAY COMPANY.

New Thin Window Bactericidal Lamp, a source of radiation of high bactericidal properties useful in certain stubborn types of skin conditions and as a prophylactic measure in the treatment of wounds.

Space No. 14

THE YEAR BOOK PUBLISHERS, INC.

Announce the just-printed 1938 Year Book of Physical Therapy, a new title in the popular Year Book series. Edited by Richard Kovács, M.D. This practical handbook presents the working essence of the most outstanding articles on physical therapy appearing in the international literature during the past year.